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INSTRUCTIONAL SCIENCE AND DEVELOPMENT INC SAN DIEGO CA
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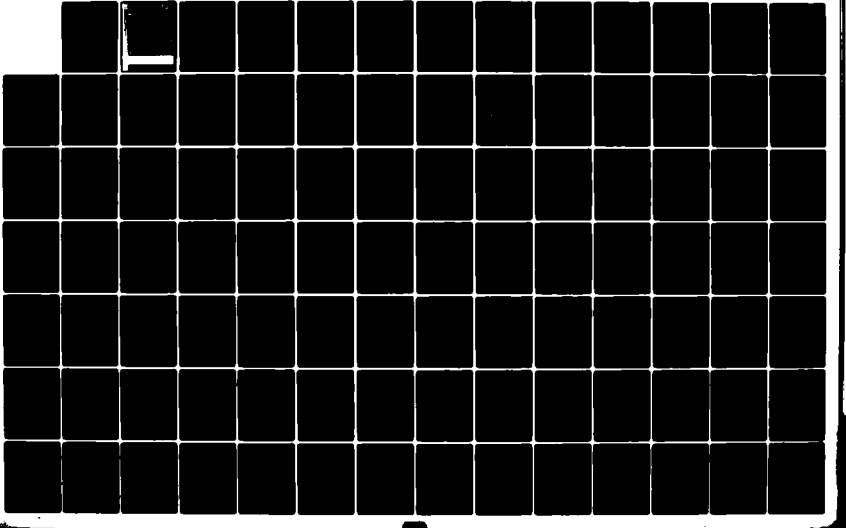

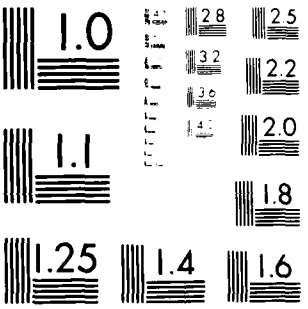

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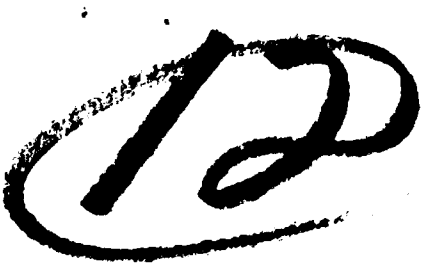

Technical Report: NAVTRAEQUIPCEN 79-C-0104-1

AUTOMATED INSTRUCTIONAL MEDIA SELECTION (AIMS)

H. D. Kribs, A. C. Simpson, and L. J. Mark
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San Diego, California 92107

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October 1983

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER NAVTRAEQUIPCEN 79-C-0104-1	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) AUTOMATED INSTRUCTIONAL MEDIA SELECTION (AIMS)		5. TYPE OF REPORT & PERIOD COVERED 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) H. D. KRIBS, A. C. SIMPSON, AND L. J. MARK		8. CONTRACT OR GRANT NUMBER(s) N61339-79-C-0104
9. PERFORMING ORGANIZATION NAME AND ADDRESS Instructional Science and Development, Inc. 5059 Newport Avenue San Diego, California 92107		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 8711 PE 62757N
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE October 1983 13. NUMBER OF PAGES 100
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Media selection, ISD, Automated Aids to ISD, Instructional Design, Media

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

As part of an overall automated aids to instructional systems development project, the Automated Instructional Media Selection (AIMS) model was developed. The model was designed to be flexible and widely applicable. It allows the user to define the media pool of up to 90 potential media, and 90 instructional characteristics. All aspects of the media pool are updatable. A user's guide is included for using the system.

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SUMMARY

A media selection model was designed and implemented by Instructional Science and Development, Inc., as part of an overall automated system to facilitate the instructional systems development (ISD) process. The development of the Automated Instructional Media Selection (AIMS) model was based on six goals. These goals were to:

a. Maximize the use of pertinent information. This was accomplished by automating the non-judgmental, data manipulation tasks of the selection process. The system accepts media pools of up to 90 media, and 90 instructional characteristics.

b. Provide flexibility in adapting the model to specific problems and changing technologies. This was accomplished by allowing user-definable media pools, and editing functions which allow changing and adding to both the media pools and required instructional characteristics.

c. Provide consideration for student stage of learning. The user-definable aspect of the system allows for inclusion of any instructional characteristics.

d. Allow for better selection of hands-on training devices. Since the system is adaptable to any training situation, there is no bias toward cognitive, learning center type media.

e. Allow for variations in the stage of front-end analysis. Media selections may be as general or as specific as available knowledge about potential instructional characteristics permits.

f. Reduce the time, effort and costs required for media selection procedures.

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FOREWORD

The Instructional System Development (ISD) model was designed to apply a systems logic approach to training program development projects. ISD approaches apparently provide superior training programs, but they are costly to implement. The Human Factors Laboratory of the Naval Training Equipment Center (NAVTRAEQUIPCEN) is undertaking a project to provide computer aids and automation to some of the ISD steps to help reduce the cost and labor intensiveness of training program development.

One effort under this project produced a Computer Aided System for Developing Aircrew Training (CASDAT), a system for aiding several steps of the ISD Process. The current report describes the development of an Automated Instructional Media Selection model (AIMS), which was designed to improve upon the media selection component of CASDAT and other previous media selection techniques.

AIMS is more applicable to a greater variety of situations than previous approaches because the user defines and rates media, media characteristics and training objective requirements to fit the peculiarities of each situation. The system averages the user's ratings to indicate the relative capability of each medium in providing instruction for individual training objectives. The ratings also are tallied across training objectives, to provide the number and percent of objectives that can be trained with each medium and the specific objectives that can be trained with any combination of the media. AIMS also offers good opportunities for computer automation.

Sample applications of AIMS are provided to illustrate use of the system for defining and selecting both standard, general-purpose media as well as specific-function training devices. AIMS can be used "as is" to aid in routine efforts to design, evaluate and select instructional media. (Early experience indicates that a 75 percent savings in time required for the media selection process can result from the use of AIMS.) Plans are being made to implement AIMS in actual training analysis and design applications at the NAVTRAEQUIPCEN. (CASDAT already is being used to provide solutions to real-world ISD problems for the Navy.)

The best future for AIMS and media selection and design in general appears to require research and development (R&D) efforts to define optimal approaches and data for application of AIMS to a variety of training design problems. A new R&D effort at this Laboratory--to incorporate computer aids such as AIMS and CASDAT into a more comprehensive system applicable to the range of Marine Corps jobs--may provide progress in this direction.

Appreciation is expressed to Mr. Joe Puig for assistance in reviewing AIMS and this report and to Mr. Pat Smith for refining the computer programs so that AIMS could be reviewed.

A. S. Blaiwes

ARTHUR S. BLAIWES, Ph.D.
Scientific Officer

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SECTION I

INTRODUCTION

The Naval Training Equipment Center (NAVTRAEQUIPCEN) has been involved with the acquisition of aviation weapon systems training for many years. To accomplish such acquisition more effectively, the NAVTRAEQUIPCEN implemented an instructional systems development (ISD) model which applies systems logic to curriculum development. The cost of ISD technology can be justified through three methods. The first of these is an intuitive argument that concerted systematic approaches are better than isolated haphazard methods. The second is demonstrations of the advantages of its products. The third is in modifications to the model which result in improvements in its cost effectiveness. All three approaches have been used in the past. However, the latter is of major concern in this report. A primary goal of the NAVTRAEQUIPCEN is to reduce the cost of the ISD application.

Several efforts toward reducing ISD costs have been undertaken recently. A preliminary study supported by the NAVTRAEQUIPCEN identified several areas where automated aids to ISD were possible. These areas included everything from the analysis of student entry level through development and evaluation of materials. [1] A related effort supported by the NAVTRAEQUIPCEN included the implementation of a generic data base to be used in the ISD phases of analysis, design, and development of Navy aircrew training programs. [2] The present study was conducted to assist in the design, development, and acquisition of a media selection component of the NAVTRAEQUIPCEN developing prototype system for aiding the application of the ISD process.

PROBLEM

The media selection component of ISD has been a time-consuming, problematic task in Navy aircrew training development. A number of structured media selection models have been developed to systematize and standardize the media selection process. However, most of these approaches have proven to be of limited value. This is due to several factors. Some are too broad or general and of little value for more advanced or specific training programs. Others tend to overemphasize media for cognitive learning tasks, even though a significant number of military tasks require extensive "hands-on" training. Some models tend to be overly theoretical, ignoring important practical considerations such as cost or availability of equipment. And almost all of the models suffer from rigidity; that is, an inability to be adapted and updated to new technologies, emerging weapon systems, and changing needs.

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[1] J. Hughes, et al., Functional Specifications for Computer Aided Training Systems Development and Management (CATSDM) Support Functions, NAVTRAEQUIPCEN Technical Report 77-C-0018-1 (San Diego, CA: Courseware, Inc., July 1978).

[2] N. C. Marcue, A. S. Blaiwes, & R. G. Bird, Computer Aided System for Developing Aircrew Training (CASDAT): An Automated Aid for Developing Aircrew Training, NAVTRAEQUIPCEN Technical Report 79-C-0076-1 (Arlington, VA: Veda, Inc., March 1983.

A variety of factors contributes to the difficulty and complexity of the media selection task. First, the nature of military jobs poses intrinsic difficulty in selecting an optimal media mix. Frequently, job performance involves a combination of procedural, perceptual, motor, and knowledge components, including decision making, which must be integrated. Thus, the learning task may not consist of discrete components which are easily associated with media hardware attributes. Likewise, it is often difficult to associate one specific medium with the learning task given a variety of attributes required of a medium in order to best learn to perform the task. It is often just as much the use of a medium and the quality of the lessonware, as it is the unique attributes of the media itself, which determine a successful media application.

In addition, instructional hardware has evolved co ually and a wide range of equipment is available for consideration. Fur rmore, unbiased information on the instructional hardware is seldom ava e. Consequently, there is little basis for empirically determining which ia hardware attributes are important to specific learning tasks.[3]

PURPOSE

Given the problems inherent in the media selection process, five interrelated goals were established as specifications for the automated media selection model. The goals were to:

a. Provide the capability to maximize the use of information pertinent to the media selection problem.

b. Provide flexibility in modifying the model to reflect specific problems and changing technology of media or media guidelines.

c. Provide for consideration of student stage of learning.

d. Allow greater, more detailed selection of training devices, such as simulators or other hands-on devices.

e. Allow for variations in the stage of front-end analysis with emphasis on the needs of planning for emerging weapon and training systems.

The purpose of the effort was to develop a working media selection model as an automated aid for ISD, demonstrate and evaluate the operation of the model in the NAVTRAEQUIPCEN environment, and provide plans for further development, demonstrations and applications of the model.

APPROACH

The effort was organized into four tasks. First, the literature on media selection was reviewed with the intent of drawing the best features from existing procedures and incorporating them where possible in an automated

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[3] R. Braby, An Evaluation of Ten Techniques for Choosing Instructional Media, TAEG Report No. 8 (Orlando, FL: Naval Training Equipment Center, Training Analysis and Evaluation Group, December 1973).

aid. Second, the functions of an automated aid were selected based on potential advantages offered. The third task was design, development and debugging of the programs for the prototype media selection model and development of a detailed user guide. The final task was application of the model to an aircrew training problem to test its utility.

RESULTS AND CONCLUSIONS

It was determined through the review of media selection techniques and the analysis of tasks performed during media selection that a common logic exists in choosing media that are effective for training. Matching the required attributes of instruction to attributes of media is central to most media models. An automated instructional media selection system was designed and developed based on that logic. The user is provided a flexible and simple data base development capability. The data base consists of instructional attributes by which to analyze information, such as learning objectives or task statements, and a media pool. Up to 90 media with 90 associated attributes may be defined by the user to analyze any number of learning objectives or task statements required by the user.

Emphasis was placed on designing the system to be a problem solving aid. That is, while existing sets of media pools and attributes may be used, the user is encouraged to create a problem specific data base. Each media selection problem is considered unique until analyzed otherwise.

As illustrated through examples and demonstrations described later in the report, the system allows a much more effective instructional development effort. Several areas of media selection which are not well attended to in some models are provided. These include stage of learning considerations, detailed selection of trainers, and variations in the stage of front-end analysis. Ultimately such matters are defined only through efforts of the user, but the system can be an efficient tool for arriving at these definitions. In addition to enriching the media selection process, the system also will save time and labor. A small scale comparison with manual selection showed better than a 4:1 time savings.

RECOMMENDATIONS

It is not anticipated that any extensive additions are needed to the system. It should be recognized, however,that the system deals only with training effectiveness. Costs can be dealt with only on a relative basis such as "high," "medium," or "low." It would be valuable to add a cost component, several of which exist, for the purpose of detailed cost comparisons and evaluation.

In addition, the system offers promise for other types of media problems. The analysis and design of trainer requirements, evaluation of new training devices considered for acquisition, impact evaluation of changing media technologies, and comparison of similar media are all possible areas for study and should be explored.

SECTION II

REQUIREMENTS FOR AUTOMATED MEDIA SELECTION

A review of the literature on media selection was performed to determine the media selection requirements to be incorporated into an automated aid to ISD. The five goals, which were established as specifications for the automated model, were used as the framework for conducting the review. The goals are:

a. Provide the capability to maximize the use of information pertinent to the media selection problem.

b. Provide flexibility in modifying the model to reflect specific problems and changing technology of media or media guidelines.

c. Provide for consideration of student stage of learning.

d. Allow greater, more detailed selection of training devices, such as simulators or other hands-on devices.

e. Allow for variations in the stage of front-end analysis with emphasis on the needs of planning for emerging weapon and training systems.

The literature review served three purposes. First, existing media selection models were examined to identify procedures and functions which might be relevant to the automated model. Second, the existing media selection models were analyzed within the context of the five goals and characteristics (discussed in a later section) of an adequate model in order to determine inadequacies of existing models and define requirements for future models. Third, the functions to be included in the automated media selection model were specified as a result of the review and critique. The following subsections describe the three aspects of the literature review.

EXISTING MODELS USED IN NAVY AIRCREW TRAINING

A sample of representative Navy aircrew training objectives was used to assess the procedures and functions of four media selection models which have been used in Navy aircrew training systems. The models are: (1) the Training Effectiveness and Cost Effectiveness Prediction (TECEP) model as originally developed by the Navy Training Analysis and Evaluation Group (TAEG), [4] (2) the Training Effectiveness-Cost Effectiveness Prediction (TECEP) technique as it was enhanced by TAEG, [5] (3) the MIL-T model

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[4]R. Braby, et al., Staff Study on Cost and Training Effectiveness of Proposed Training Systems, TAEG Report No. 1 (Orlando, FL: Naval Training Equipment Center, Training Analysis and Evaluation Group, 1972).

[5]R. Braby et al., A Technique for Choosing Cost Effective Instructional Delivery Systems, TAEG Report No. 16 (Orlando, FL: Naval Training Equipment Center, Training Analysis and Evaluation Group, April 1975).

described in the Military Specification: Training Requirements for Aviation Weapon Systems (MIL-T-29053) [6] and (4) the LAMPS MARK III methods/media model developed by IBM. [7] To simplify discussion throughout this report, the original TECEP model is referred to as the TAEG model and the enhanced model is identified as the TECEP technique.

Each of the models performs the following five tasks with varying degrees of detail found in the procedures:

a. Identify specific objectives and training tasks

b. Analyze each specific objective by attribute

c. Match instructional attributes against defined media pool attributes

d. Rank media for training effectiveness

e. Perform costs/constraints trade-offs for final selection.

Since cost effectiveness considerations were beyond the scope of the effort, the models were evaluated to the point of rank-ordering the media for training effectiveness. The requirements of the last task, final selection based on trade-offs, were only reviewed briefly. The procedures for each model are summarized below.

TAEG MODEL. The TAEG model was developed to apply the concepts of learning theory, economic analysis, and other information acquired by use of the scientific method to the task of training system design. The model consists of nine steps. However, the last five steps relate to selecting media on the basis of cost effectiveness, rather than training effectiveness, and they are not discussed. During these steps the media alternatives are rank-ordered and trade-offs are performed for final selection. A description of the four training effectiveness steps is provided below.

a. Task Description and Analysis. Each task to be performed is described in terms of the skills and knowledges required to accomplish the functions. Where possible, specific training objectives should be provided as the task descriptions.

b. Personnel Characteristics. A definition of student entry level characteristics is used to determine the starting point for training.

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[6] Military Specification: Training Requirements for Aviation Weapon Systems, MIL-T-29053 (Orlando, FL: Naval Training Equipment Center, October 1977).

[7] LAMPS MARK III Methods/Media Selection Model (Manassas, VA: IBM Federal System Division, 1979).

c. Training Tasks and Training Stages. Training tasks are organized into a series of stages that progress through prerequisite skills to advanced skills. The general characteristics of the tasks to be accomplished within each stage are identified as one of the following 13 task categories:

(1) Recalling Facts and Principles

(2) Recalling Procedures

(3) Non-Verbal Identification

(4) Non-Verbal Detection

(5) Using Principles, Interpreting, Inferring

(6) Making Decisions

(7) Continuous Movement

(8) Verbal Detection and Identification

(9) Positioning and Serial Movement

(10) Repetitive Movement

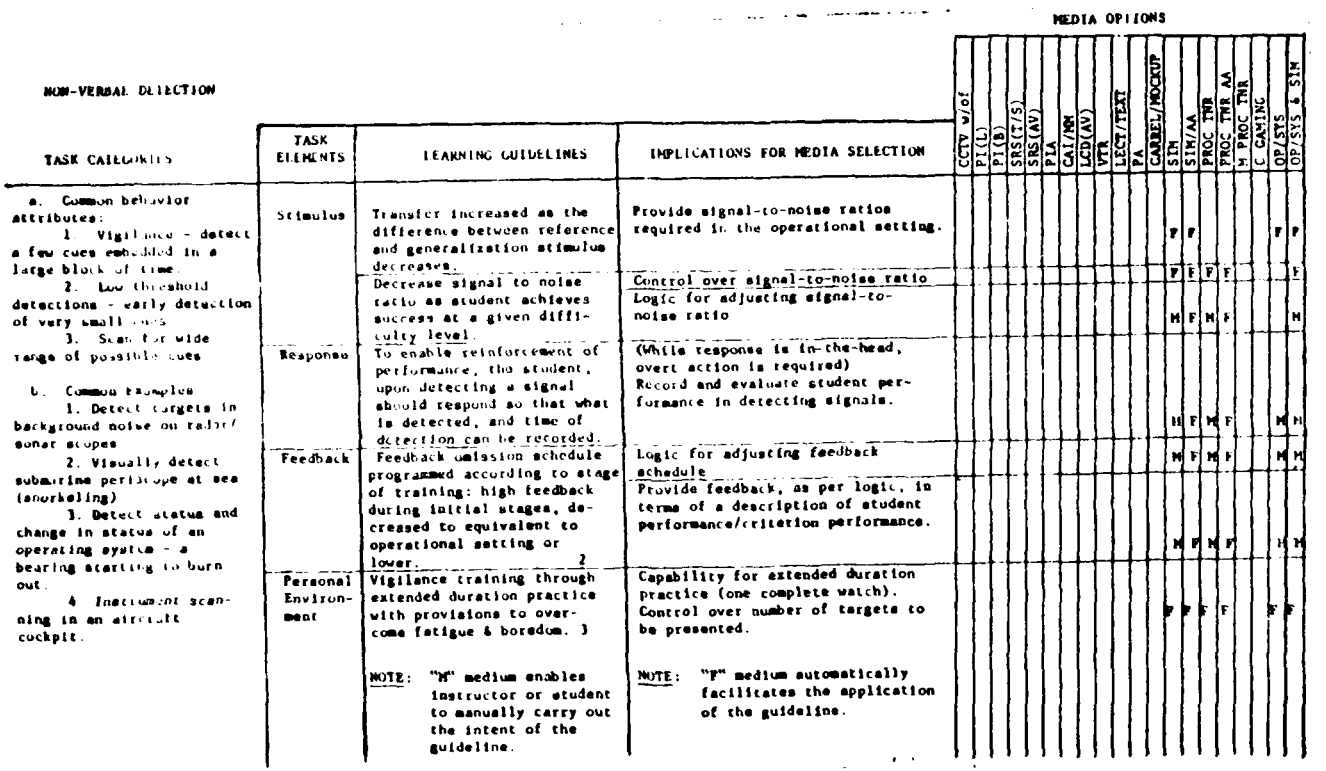
(11) Written Verbalization

(12) Oral Verbalization

(13) Other Verbalization, including Signs.

d. Determination of Useful Media Options. The training system designer uses the media selection matrix to identify a cluster of media which satisfy the characteristics of specific training tasks. A sample page from the media selection matrix for the task category Non-Verbal Detection is provided in Figure 1. As shown, the first column, Task Categories, contains descriptions of the common behavioral attributes and examples for the task categories incorporated into the matrix. The next column, Task Elements, divides each task category into elements so learning guidelines can be associated with four standard elements of a task (stimulus, response, feedback, personal environment). The column Learning Guidelines, contains rules-of-thumb, based on learning theory, for designing and using a training system for a specific type of task. A total of 105 learning guidelines are identified and associated with the 13 task categories. The column, Implications for Media Selection, contains one or more implications associated with each learning guideline. They serve to simplify the task of determining if a specific medium facilitates the use of the learning guideline. The media pool consists of 20 options which are defined in a separate table. The "M" and "F" designations are described as notes at the bottom of the matrix. [8]

[8] See footnote 4 on page 10.



NON-VERBAL DETECTION

TASK CATEGORIES	TASK ELEMENTS	LEARNING GUIDELINES	IMPLICATIONS FOR MEDIA SELECTION	MEDIA OPTIONS: CCTV w/o/	PT(L)	PT(B)	SRS(T/S)	SRS(AV)	PTA	CAI/NM	LCD(AV)	VTR	LECT/TEXT	PA	CARREL/MOCKUP	SIM	SIM/AA	PROC TNR	PROC TNR AA	M PROC TNR	C GAMING	OP/SYS	OP/SYS & SIM
a. Common behavior attributes: 1. Vigilance - detect a few cues embedded in a large block of time. 2. Low threshold detections - early detection of very small cues. 3. Scan for wide range of possible cues b. Common examples 1. Detect targets in background noise on radar/sonar scopes 2. Visually detect submarine periscope at sea (snorkeling) 3. Detect status and change in status of an operating system - a bearing starting to burn out. 4. Instrument scanning in an aircraft cockpit.	Stimulus	Transfer increased as the difference between reference and generalization stimulus decreases.	Provide signal-to-noise ratios required in the operational setting.													F	F					F	F
		Decrease signal to noise ratio as student achieves success at a given difficulty level.	Control over signal-to-noise ratio													F	F	F	F				F
			Logic for adjusting signal-to-noise ratio													M	F	M	F				M
	Response	To enable reinforcement of performance, the student, upon detecting a signal should respond so that what is detected, and time of detection can be recorded.	(While response is in-the-head, overt action is required) Record and evaluate student performance in detecting signals.													H	F	M	F			M	M
	Feedback	Feedback omission schedule programmed according to stage of training: high feedback during initial stages, decreased to equivalent to operational setting or lower. [2]	Logic for adjusting feedback schedule													M	F	M	F			M	M
			Provide feedback, as per logic, in terms of a description of student performance/criterion performance.													M	F	M	F			M	M
	Personal Environment	Vigilance training through extended duration practice with provisions to overcome fatigue & boredom. [3]	Capability for extended duration practice (one complete watch). Control over number of targets to be presented.													F	F	F	F			F	F
		NOTE: "M" medium enables instructor or student to manually carry out the intent of the guideline.	NOTE: "F" medium automatically facilitates the application of the guideline.																				

Figure 1. A sample page from the TAEG media selection matrix.

TECEP TECHNIQUE. The TECEP technique was designed to provide: (1) a set of learning guidelines appropriate to Navy job tasks, and (2) a method for selecting cost effective instructional delivery systems that support the use of those learning guidelines. Aagard and Braby report that the technique uses learning algorithms to combine and sequence the guidelines. [9] As defined by Braby, et al., ". . . a learning algorithm is a step-by-step prescription for a student to follow in learning any specific task in a class of learning tasks. . ." [10]

Use of the TECEP technique requires expertise, and is perhaps best viewed as a job aid for an experienced training system designer. The TECEP technique is a three-step approach to media selection. The first step presents a set of learning guidelines and an algorithm for each class of training tasks. The second step identifies instructional delivery systems capable of supporting each set of learning guidelines and algorithm, while the third step provides a cost model for projecting the costs of each instructional delivery system alternative in a specific training setting. Only steps one and two are discussed below, since cost effectiveness considerations were beyond the scope of the effort.

The initial step is to classify and group the training objectives according to the type of learning algorithm required to accomplish the objective. This requires matching each training objective in the proposed training system with the learning algorithms for achieving the objective. A table describing the types of learning algorithms and the characteristics (action verbs, behavioral attributes, and examples) of the training objectives that they support is used to compare against the characteristics of the objectives. The 12 types of learning algorithms are:

a. Recalling bodies of knowledge

b. Using verbal information

c. Rule learning and using

d. Decision making

e. Detecting

f. Classifying

g. Identifying symbols

h. Voice communicating

---

[9] J. A. Aagard and R. Braby, Learning Guidelines and Algorithms for Types of Training Objectives, TAEG Report No. 23 (Orlando, FL: Naval Training Equipment Center, Training Analysis and Evaluation Group, March 1976).

[10] See footnote 5 on page 10.

i. Recalling procedures and positioning movement

j. Steering and guiding; continuous movement

k. Performing gross motor skills

l. Attitude learning

The second step is to identify instructional delivery systems that support the use of the learning algorithm required for each training objective. This step actually consists of two substeps: (1) identification of instructional delivery systems (media options), and (2) practicality tests.

In the first substep, all of the instructional delivery systems with stimulus, response, and feedback capabilities required to support the events in the learning algorithm are identified. Instructional Delivery System Selection Charts developed for each of the 12 learning algorithms serve as job aids for training system designers. As shown in the example in Figure 2, a list of instructional delivery systems is provided across the top of the chart, while special criteria are listed down the left side. An "X" is placed in the cells of the systems that meet the special criteria. The training system designer can easily identify candidate delivery systems by checking the relevant selection criteria on the left side and looking for the delivery systems that have an "X" in that cell.

An alternate approach can be used to consider instructional delivery systems not included in the charts. Two job aids are provided for experienced training system designers: (1) a list of 55 generic media characteristics which includes stimulus, response, and feedback characteristics that can be used to describe types of instructional media, and (2) a list describing 89 general types of media that can be incorporated into instructional delivery systems. With these, the generic media characteristics required to implement the learning algorithms can be specified and the media containing these characteristics can be identified. This approach requires expert knowledge of media, the algorithms, and the subject matter.

The second substep in step two is testing the candidate instructional delivery systems for practicality and eliminating impractical delivery system candidates prior to cost estimating in the third step. Each delivery system is evaluated in terms of the following 11 criteria:

a. Marginal technical solution

b. State of the art system

c. Size of the system

d. Interface with existing programs

e. Lead time required to produce system

f. Budget cycle constraints

INSTRUCTIONAL DELIVERY SYSTEM CHART FOR THE ALGORITHM

RECALLING BODIES OF KNOWLEDGE

Directions:

To choose a delivery system:

1. Place a "√" (light pencil) in boxes representing criteria (rows) that must be met.

2. Select the delivery systems (columns) that have an "X" in each row designated by a "√". These are the candidate delivery systems.

Criteria for Selecting Instructional Delivery Systems

	Alternative Instructional Delivery Systems								
	Delivery Approaches Permitting the Application of All Learning Guidelines and Algorithm					Delivery Approaches NOT Permitting Complete Application of Learning Guidelines and Algorithm			
	CAI	Teaching Machine - Branching	Microfiche with Self-Scoring Tests	Programmed Text - Branching with Self-Scoring Tests	Audio Visual Carrel with Program Texts, AV Modules and Self-Scoring Tests	Traditional Classroom with Instructor, Overhead Projector, Texts, and Paper and Pencil Tests	Independent Study Using Textbooks, Handbooks, Tests and Workbooks	Instructional Television Broadcast or CCTV Without Feedback, Tests	Programmed Text - Linear with Instructor Scored Criterion Test
Stimulus Criteria									
● Visual Movement									
Limited	X	X			X			X	
Full	X				X			X	
● Visual Spectrum									
Full Color	X	X	X		X	X	X	X	
● Audio									
Voice Sound Range	X	X			X	X		X	
Full Sound Range					X				
Training Setting Criteria									
● Individual Trainees at Fixed Location	X	X	X	X	X	X		X	X
● Individual Trainees with Simultaneous Instruction at Many Locations								X	
● Individual Trainees with Independent Instruction at Any Location			X	X			X		X
● Small Group						X		X	
● Large Group at a Single Location						X		X	
● Team Setting									
Administrative Criteria									
● Site of Courseware and Special Hardware Development									
Local			X	X	X	X	X		X
Central	X	X	X	X	X		X	X	X
● Magnitude of Acquisition Cost									
Low			X	X		X	X		X
High	X	X			X			X	

Figure 2. A sample selection worksheet from the TECEP technique.

g. User acceptance of innovations

h. Resources for courseware development

i. High cost system alternative

j. Learning style of trainees

k. Any other applicable constraints.[11]

MIL-T MODEL. The media selection model described in MIL-T-29053 uses a sorting algorithm to divide objectives into categories and then select media alternatives from the following media pool:

a. Workbook

b. Mediated Interactive Lecture

c. Slide tape

d. Videotape

e. Random Access Slide

f. CAI

g. CAI Simulation

h. Simulation

i. Actual Equipment

Figure 3 depicts the selection algorithm. The decision points (Q1-Q5) refer to questions 1 through 5 described in Figure 4. These questions attempt to determine the critical features of an objective which determine the best media for teaching the objective. Question 1 is concerned with the type of learning involved and Question 2 focuses on the level of content. Question 3 is concerned with variability in the examples and practice items necessary for accomplishing an objective. Question 4 focuses directly on the minimal media attributes necessary to teach an objective, while Question 5 addresses the memory load involved. To use the model, one enters the selection algorithm at the box labeled Q1 in the center of the algorithm. Then, one proceeds through the decision points answering the questions until a terminal point is reached. The terminal points (M1-M44) refer to three or four media selected for each training objective from the pool listed in rank order according to their desirability for an objective, or provide additional information or questions to be asked in the selection process.[12]

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[11] See footnote 5 on page 10.

[12] See footnote 6 on page 11.

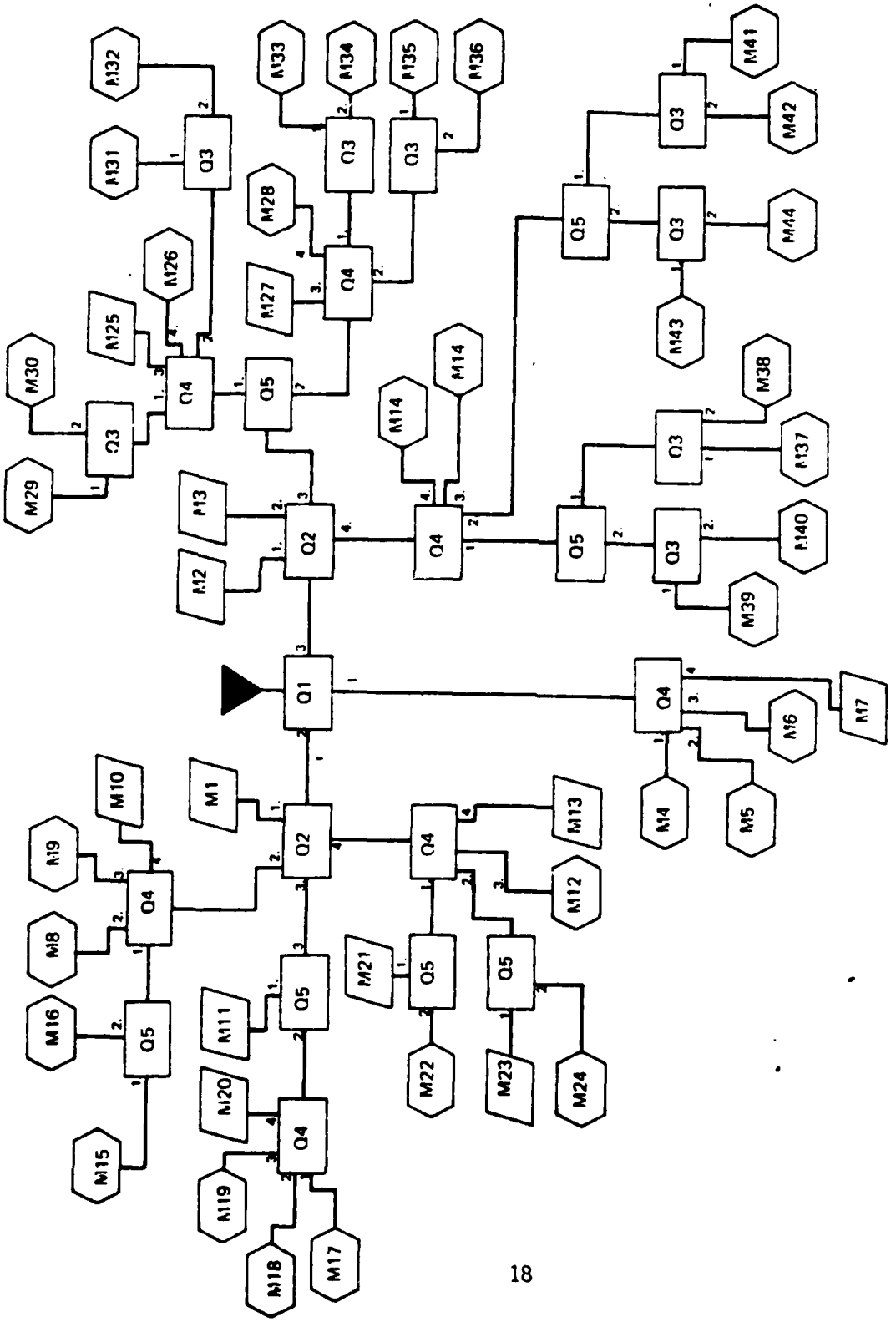

Figure 3. Algorithm for the MIL-T media selection model.

Q1 is the number of the choice which best answers this question for a given objective:

What is the level of behavior expected of the student in this segment?
- 1 = familiarization
- 2 = discriminated recall
- 3 = rule using

Q2 is the number of the choice which best answers this question for a given objective:

What level of content is being taught in this segment?
- 1 = familiarization
- 2 = paired associate
- 3 = concept
- 4 = rule

Q3 is the number of the choice which best answers this question for a given objective:

Is the minimum critical set of instances the student needs to see small or large?
- 1 = small
- 2 = large

Q4 is the number of the choice which best answers this question for a given objective:

What is the minimum display requirement?
- 1 = verbal and/or symbolic and/or static simple pictorial
- 2 = verbal and/or symbolic and/or static complex pictorial
- 3 = dynamic pictorial
- 4 = interactive

Q5 is the number of the choice which best answers this question for a given objective:

If the memorization component of this objective large or small?
- 1 = small
- 2 = large

Figure 4. Key to the meaning of Q1-Q5 decision points in the MIL-T selection model.

LAMPS MARK III MODEL. The LAMPS MARK III model was designed to provide a systematic analysis of the methods/media requirements for each objective in the LAMPS MARK III training program. The model emphasizes three major factors in prioritizing objectives and selecting media:

a. "Hands-on" versus "cognitive" requirements

b. Instructional characteristics required

c. Level and type of learning to be achieved.

The model assumes a subject matter expert and an instructional technologist work together to make judgmental decisions about these three factors. The technique requires going through the following five-step process for each objective using the sample worksheet shown in Figure 5.

a. Determine if objective is hands-on or cognitive. An objective is "hands-on" if it requires the use of operational equipment or simulations to learn the specified behavior. Any objective which can be fulfilled through verbal, pictorial, symbolic, or any other non-operational means is classified as "cognitive."

b. Determine instructional characteristics. The user determines the instructional characteristics, or media attributes, required to accomplish an objective effectively and efficiently by checking off the essential requirements on the worksheet.

c. Select appropriate methods/media. Once the instructional characteristics are checked off on the worksheet, they are matched against the capabilities of each alternative in the media pool. This is accomplished by use of separate media-by-characteristics matrices for hands-on and cognitive media.

d. Determine learning classification. At this point, the selected media are identified on the worksheet with no ranking. Objectives are then classified by the assessed level of learning. The learning level categories are shown under the columns for hands-on and cognitive tasks on the left side of Figure 5. For hands on tasks, the fidelity requirements of the media used are likely to increase with each level of learning. For cognitive skills, mastery is gained through a progression of learning experiences.

e. Prioritize selected media. The level of learning is used to prioritize the methods/media selections. Priority assignment tables (one for cognitive and one for hands-on) rank order the media in the pool by each level of learning. Using the priority assignment tables the selected media are ranked by placing the appropriate number next to the media on the worksheet. [13]

[13] See footnote 7 on page 11.

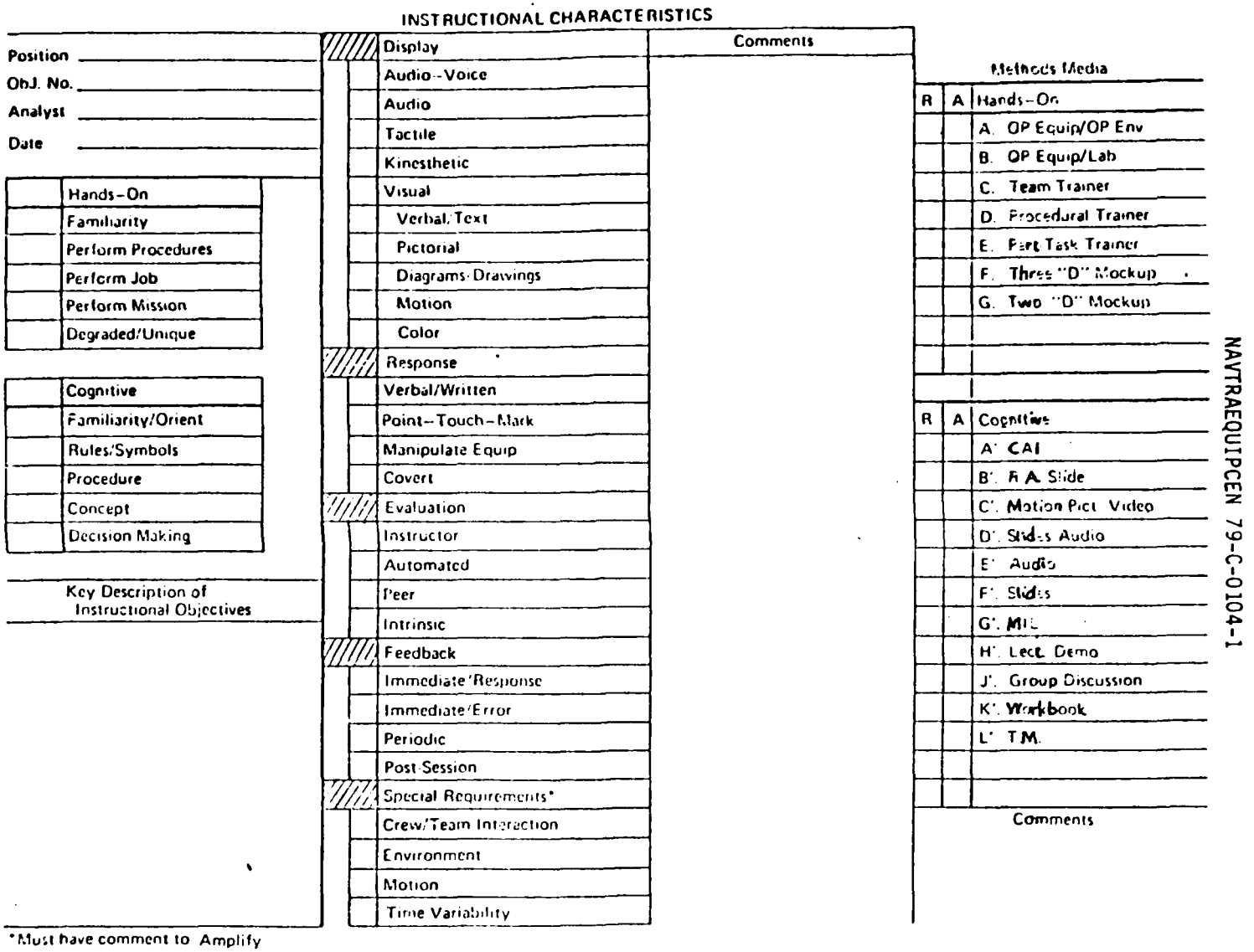

Figure 5. Selection worksheet from the LAMPS MARK III media selection model.

CRITIQUE OF EXISTING MODELS

The four media models -- TAEG, TECEP, MIL-T, and LAMPS MARK III -- were evaluated by the study team within the context of the five goals previously discussed for the automated aid and seven characteristics (see Table 1) specified for an adequate model in order to identify existing inadequacies and determine requirements. The characteristics of an adequate media selection model were defined in a study conducted by TAEG to compare and evaluate ten techniques for selecting instructional media.[14] Nine detailed characteristics were recommended as a set of guidelines to be used to improve and expand existing models. Seven of these characteristics, which were considered relevant to the present effort, are summarized in Table 1.

Starting with the first characteristic in Table 1, it was judged that the four existing models were techniques which assisted professionals in handling media selection with varying degrees of adequacy. In terms of the last characteristic, several of the models were previously tested with objectives from several projects and none of them was considered to be widely applicable. Each model was found to be limited and inflexible in one or all of the remaining five characteristics summarized in Table 1. The following paragraphs describe each model.

Experience with the MIL-T model indicated that it was adequate for grouping objectives into general categories of media requirements, but there were problems and limitations. First, the limited media pool kept the selections at a broad, general level. There was no provision for making finer comparisons, such as among types of CAI or types of simulators. Further, it seemed difficult to add additional media to the pool, since the logic governing the relationships among the instructional characteristics and the media themselves was not explicit.

A second problem with the MIL-T model was its emphasis on "cognitive," learning center type media. Workbook and mediated interactive lecture each appear in 27 of the 44 terminal points. Objectives considered to be "hands-on" were generally lumped into one broad "simulator" category, which requires another selection process (not provided by the model) to be further defined. In fact, only three terminal points present simulator as an alternative.

A third difficulty was the assumption that the user was knowledgeable in esoteric instructional technology. Phrases such as "discriminated-recall level of behavior," "paired-associate level of content" and "static complex pictorial" are likely to have little meaning to a person with strictly subject matter expertise and general training experience within a given area. Yet that same person might be the one best suited to clearly define the essential characteristics required of the media. Even though the model is automated in the CASDAT implementation of the system, its usefulness was limited.

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[14] See footnote 3 on page 8.

[15] See footnote 2 on page 7.

TABLE 1. SEVEN CHARACTERISTICS OF AN ADEQUATE MEDIA SELECTION MODEL

	Characteristic	Description
1.	Technique for Professionals	Tool to assist instructional technologists in performing a judgmental task that cannot be fully proceduralized. Formal process with a set of operationally defined terms and logic based on theoretical concepts about the processes of teaching and learning.
2.	Useful Variables	Two types: (1) variables that describe a training program as a learning system (i.e., stimulus modes, response modes, feedback modes, learning strategies, and learning styles.) and (2) variables that define costs/constraints trade-offs.
3.	Media Alternatives	Extensive pool, including both traditional and new forms of instructional media, and media for supporting classroom and individualized instruction, on-the-job training.
4.	Training System Descriptions	Descriptions of: (1) broad instructional strategies for general types of learning tasks, (2) specific mixes of media for specific learning tasks, and (3) specific design and use parameters to be incorporated into training system specifications for production or procurement of media packages.
5.	Growth Potential	Capability for adding or changing media types, learning guidelines, and economic factors. Applicable in a broad variety of current and emerging training situations.
6.	Data Manipulation	Emphasis on decision making, with data retrieval and processing as a minor task. Manual computations and mechanics of combining factors through the use of automatic data processing, two dimension tables, and simple math models.
7.	Testing	Tested with objectives from several training projects. Adaptable to a variety of training projects.

Application of the TECEP technique proved to be a laborious task. Several data retrieval and matrix matching tasks appeared to be well suited to automation to reduce labor intensiveness. In general, the model was not flexible to user requirements. No technique for adding media or instructional attributes to the Instructional Systems Delivery Charts was provided and use of the alternative approach was difficult and time-consuming although the media pool is extensive. Variations in the level of descriptions of media alternatives were not included. The media selections were quite specific, rather than broad or overly general. The model was not adaptable to variations in the stage of development for proposed training programs.

In contrast, the TAEG model provided more user flexibility. The format of the media selection matrix made it fairly easy to use because the task categories, task elements, learning guidelines and media pool were contained in one matrix. The existing media pool was limited and the selections were specific, but it was stated that additional media options could be added.

Experience with the LAMPS MARK III model was generally a positive one. The worksheet approach, where the user simply checks off the appropriate instructional characteristics, has several advantages. First, it was simple and straightforward, requiring little interpretation of esoteric terminology. Second, it allowed the user to focus on the single task of matching objectives to instructional attributes. This made it possible to complete the matching task quickly and with a minimum of fatigue. The process of going through the media pool matrices and selecting the media with the required instructional characteristics was time consuming and mechanical. These characteristics made this process a prime candidate for automation.

The media pool options were broad and general, but probably suited to the requirements of the LAMPS MARK III training program. A comprehensive, but generalized, set of cognitive media is included in the media pool. For any given cognitive medium listed in the pool, a number of devices, methods, and techniques can be employed for actual implementation. Where minimal instructional data are available for making selections, cost and practicality most influence the media to be selected. The model selects generalized "hands-on" devices, primarily on the basis of fidelity requirements indicated by the level of learning. The design of these devices is assumed to take place at a later date based on the instructional objectives. No capability is provided, however, for assessing the value of specific device parameters such as stated in characteristic 4 (third part) of Table 1.

The relationship between the characteristics identified as inadequate in the existing models and the goals established for the automated aid are described below. To facilitate the discussion, the five goals are summarized as:

a. Maximize the use of pertinent information (Goal 1).

b. Provide flexibility to modify the model to reflect specific problems and changing technology (Goal 2).

c. Consider student stage of learning (Goal 3).

d. Allow more detailed selection of training devices (Goal 4).

e. Allow for variations in the stage of front-end analysis (Goal 5).

Starting with characteristic two in Table 1, each of the models provides a predetermined set of variables to be used in analyzing a given media selection problem. The usefulness of these variables changes considerably from one training situation to another. The more flexibility the media selection team has in defining the useful variables, the better the model will address the given media selection problem. Therefore, the inadequacies found in defining useful variables relate to the requirements identified in all of the goals.

All of the models were considered inadequate on characteristic three, media alternatives. Each model provided a limited number of options in the media pool and the descriptions were broad and general. Although the TECEP technique has an alternative approach with an extensive media pool to select from, it was too time-consuming and tedious to be considered feasible for large training programs. These inadequacies support the requirements stated in Goals 1, 2, and 4.

None of the models satisfied the requirements of characteristic four, training system descriptions. The models provide descriptions of either broad instructional strategies for general tasks or specific media mixes for specific tasks. They do not permit detailed descriptions which could be incorporated into training system specifications for media packages. The capability to address different types of training system descriptions is required if the technique is to be applicable to a variety of media selection problems. This inadequacy relates to the requirements of Goals 1, 2, 4, and 5.

Each of the models was deficient in terms of characteristic five, growth potential. There was limited capability for adding to or changing the parameters of any of the models. Each model offers a predefined approach for analyzing a given training situation. The issue is one of which media selection model to use, not how to change the model parameters. The capability for adaptation supports all five of the goals.

Characteristic six, data manipulation, supports the concept of an automated aid to media selection for the ISD process. The inadequacies described in existing models were used to derive the requirements outlined below.

FUNCTIONS OF AUTOMATED MEDIA SELECTION

The functions to be incorporated into the automated aid to ISD were derived from the literature review on the current status of media selection and the evaluation of existing models used in Navy aircrew training. As described earlier, the typical media selection model accomplishes five tasks: (1) initially, a set of specific objectives and tasks is required; (2) these objectives and tasks are analyzed against a predetermined set of instructional characteristics/attributes; (3) the identified attributes are then matched against the attributes of the media in a predefined pool to select media alternatives; (4) the alternatives are rank-ordered for training effectiveness; and (5) the final media selection is based on costs/constraints trade-offs.

An automated aid can perform these tasks more efficiently, as well as provide the user team of instructional technologists, media specialists, and subject matter experts with expanded capabilities and flexibility to adapt the process to the requirements of the media selection problem at hand. The scope of the expanded capabilities and flexibility requirements were based on the inadequacies described for existing models. The emphasis of the automated aid is on decision making with appropriate personnel performing judgmental tasks and the computer accomplishing tedious mechanical processing, matching, and retrieval tasks. The growth potential of the automated aid includes the capability to define an extensive media pool and provide variable descriptions (broad instructional strategies, or specific media mixes, or training system specifications) based on the information available in current and emerging training situations. Figure 6 presents a conceptual flow of the tasks in the expanded media selection process. To facilitate explanation of the expanded capabilities, the tasks shown in Figure 6 have been organized into the following five functions:

a. Problem analysis

b. Definition

c. Information analysis

d. Matching

e. Trade-offs.

Beginning at the top of Figure 6, the first set of tasks in the automated model requires the user team to perform a problem analysis. First, they must determine whether any existing model meets the needs of this particular media selection problem. A variety of differences seems to occur in media selection problems: for example, emphasis on particular types of trainers which may be unique to the situation, differences in how one must account for entry level characteristics (such as reading problems or other learning handicaps), training which requires extensive on-the-job training or high performance-based instruction. If an existing model does not meet the needs, then there

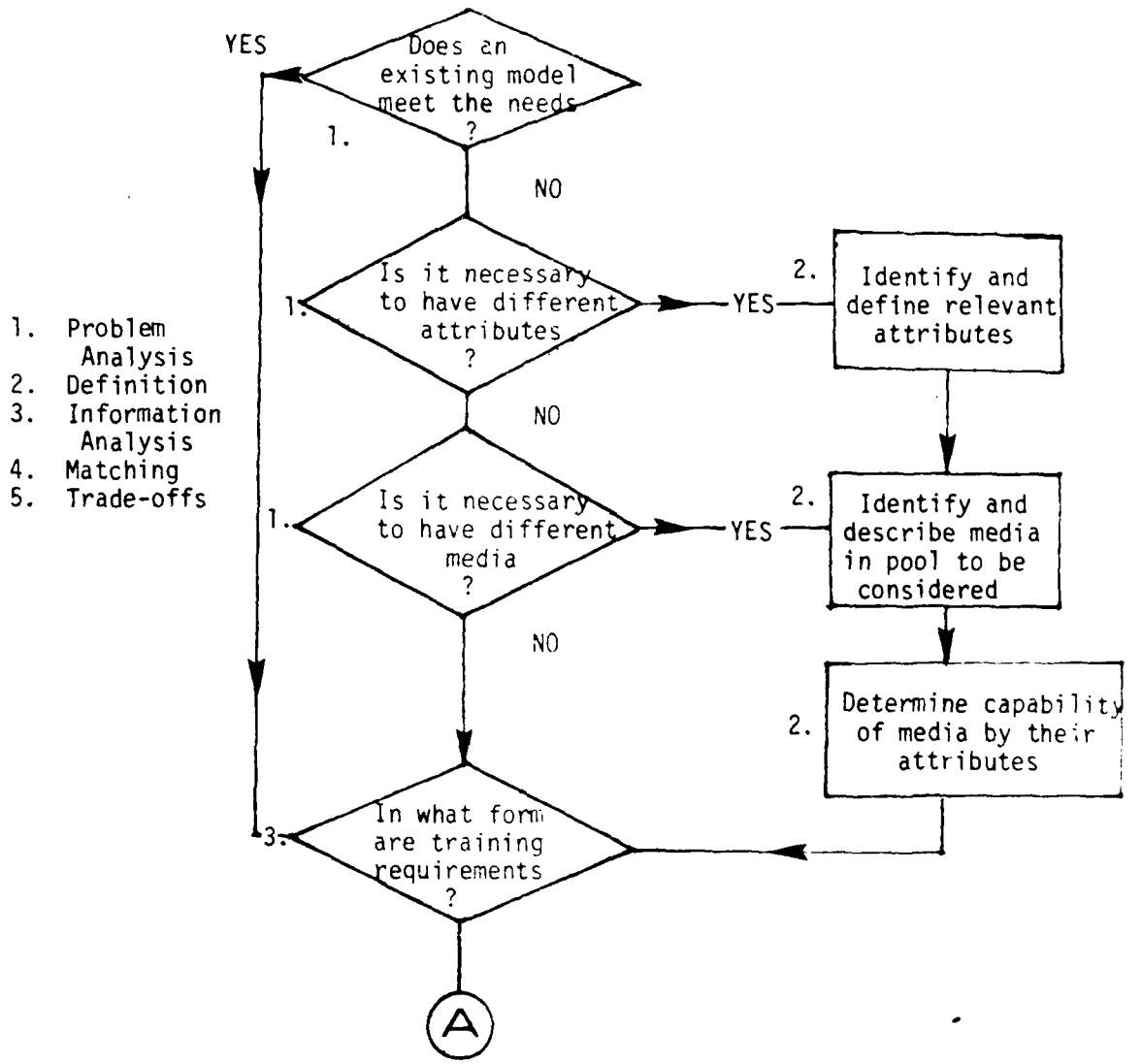

Figure 6. Flow of tasks in automated media selection with automated aids.

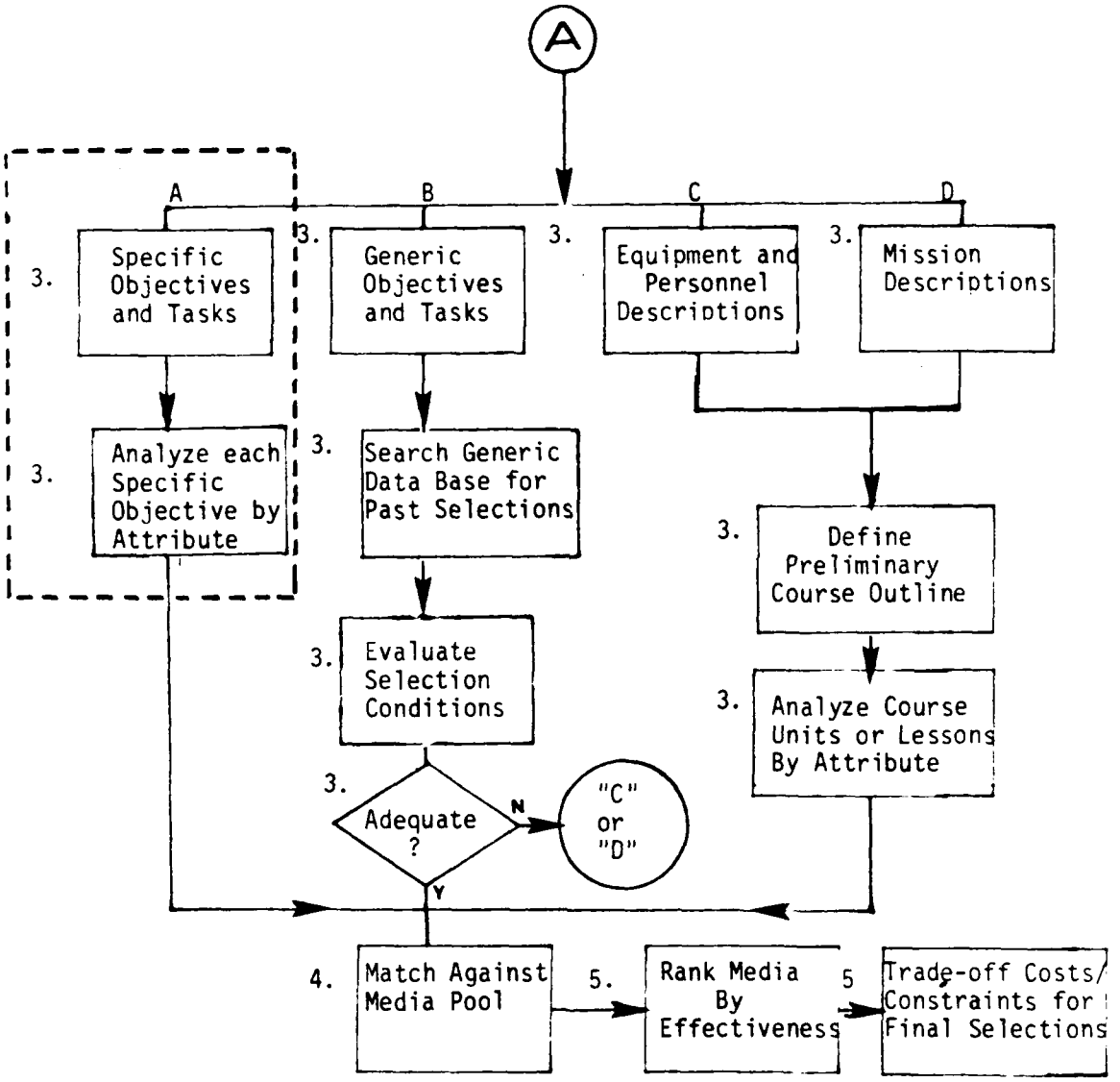

Figure 6. Continued.

are two general reasons: (1) the attributes which must be used to describe the instruction are inadequate, and (2) the media pool, which is to be selected from,is inadequate. Therefore, the problem analysis includes asking questions concerning these two aspects of media selection. If it is determined that different attributes or media are required, then the tasks in the definition phase are performed. These tasks are identified by a "2" in the flowchart. The user team identifies the relevant attributes for analysis of the instructional requirements, determines the media to be considered, and makes judgments on the media capabilities by defined attributes.

The user team now enters the information analysis phase. In this phase, the information available to describe the training requirements is analyzed to determine which attributes and perhaps how much capability the training system will require. Ordinarily, this is done on the basis of specific statements of objectives and tasks which are required to be performed. However, such specific information is not always available. Three additional forms of information are possible: (1) generic objectives and tasks, (2) equipment and personnel descriptions, and (3) mission descriptions. These are shown as "B," "C," and "D" in Figure 6. The tasks designated as "A" within the dotted line represent those found in typical media selection models.

If specific objectives and task statements exist, or time is available to determine them, then each objective may be analyzed by the attributes required for training and matched against the media pool. A different approach must be taken for the other three forms of information. If the training system analysis for an aircraft is not complete, CASDAT [16] is intended to provide generic tasks and objectives for any aircraft. The data base may be searched to determine past media selections for the generic objectives or the objectives reanalyzed for a newly specified media pool. If the past media selections appear to fit the new training situation, then the matching and trade-off phases may proceed.

However, trade-offs and constraints often differ from one media selection situation to another. A variety of conditions may occur which make the previous selections inappropriate for the new training systems. For example, trade-offs in prior analyses may have been based on fixed funds which required selecting less than the most effective media, whereas the new training system does not have cost restrictions.

If specific or generic task statements and/or objectives do not exist, the user must go to one of the other two forms of information shown in Figure 6 to describe the training requirements. The new job for which training is required may have equipment operation/maintenance and personnel descriptions. Lacking such equipment and personnel job descriptions, it may also be possible that a less detailed but sufficient description of the overall mission with references to the job to be trained can be utilized. In either case, the user needs to define a preliminary course outline which

[16] See footnote 2 on page 7.

contains the topics and sequence of topics with time to train by topic if possible. Then the user can determine the appropriate attributes required of media based on the broad topics in the course of training. This, of course, is in lieu of the availability of objectives. It is always desirable to select media for each objective when the information is available in the form of objectives.

The following section describes the design and operation of the prototype media selection model in terms of both the five goals and the five functions established for the automated aid to ISD.

SECTION III

AUTOMATED INSTRUCTIONAL MEDIA SELECTION (AIMS)

As described in the previous section, a framework was established to guide the development of AIMS. The framework consisted of: (1) the goals defined for an automated aid to media selection, (2) the characteristics of an adequate media selection model identified from the literature, and (3) an analysis of the functions to be performed in automated media selection. This section discusses two aspects of AIMS. First, it summarizes the design of AIMS in terms of the media selection functions it performs. Second, it illustrates the flexibility and power of AIMS in terms of the five goals established for automated media selection.

DESIGN AND OPERATION OF AIMS

The automated aspects of media selection depend on the judgments of ISD personnel who must determine what the training requirements are and how well media generally meet such requirements. The judgments, based upon learning theory, subject matter experience, media guidelines and other "principles," cannot be automated well. They must be left to human judgment as in the case with the media selection models reviewed earlier.

However, the basic logic in all of the media selection models reviewed is that of matching the required characteristics of instructional events to the attributes of media available. If a particular medium has all of the attributes needed to satisfy the intended instruction, that medium becomes a candidate. Those media not meeting the requirements are discarded from the list. The AIMS system is designed to automate this aspect of media selection. Other factors such as organizational constraints, policy, and costs are considered, but the logical matching of the required characteristics to media attributes is central.

The AIMS system is designed to provide rapid access to a data base of media and media combinations, cross-referenced with instructional characteristics. The system allows a user to input the instructional characteristics required for a given training objective, and the computer then selects media which can deliver the required characteristics, scores the training effectiveness of each medium, rank-orders the selected media/media combinations according to their effectiveness and prints out the results. The computer performs these tasks many hundreds of times faster than humanly possible.

Instructional characteristics such as equipment availability, equipment costs, task difficulty, task frequency, and stage of learning may be included as part of the selection process. Since the instructional attributes do not have to relate to effectiveness variables per se, it is possible to perform trade-offs for a variety of factors and constraints. The system is totally flexible so that the media and media combinations as well as the selection criteria themselves are determined by the requirements and constraints of the project at hand and not general notions of media effectiveness. Procedures for using the AIMS system are detailed in the User's Guide in the Appendix of this report. A summary of the major steps is presented here.

Five functions of media selection were previously discussed. They are: (1) problem analysis, (2) definition, (3) information analysis, (4) matching and (5) trade-offs. Of these, the AIMS system is of greatest assistance in the matching and trade-offs functions. The system also assists in the function of information analysis by reducing the time to record and store the results of the analysis of training objectives. As described earlier, depending on the stage of front-end analysis, information analysis can also take the form of generic objectives, functional hardware analysis, personnel job descriptions, or mission analysis. The AIMS system is designed to analyze all of these information sources in an efficient manner. The function of problem analysis and definition must be performed by ISD personnel in developing an AIMS data base for a media selection problem. The steps in using AIMS are:

a. Determine the Media to be Considered. The user of the system should first make a list of all the media, or combinations of media, to be included in the pool. It is advisable, at this stage, to allow a wide range of alternatives for a given project. If need be, the pool can easily be narrowed if a shorter version is desired. AIMS allows the definition of any pool of up to 90 media and 90 attributes. After input of the media pool AIMS will print the media pool list. Figure 7 shows a sample media pool listing. It is a broad list including both cognitive and hands-on type media. Once you have determined the media relevant to your own training requirements, you can begin the next phase.

b. Determine the Instructional Characteristics. Defining the instructional characteristics, or "attributes" as they are also called is an important task. Figure 8 presents a sample list of attributes. Note how the attributes are clustered into groups of similar characteristics: (1) Display characteristics, (2) Response mode, (3) Evaluation mode, (4) Feedback, and (5) Special Requirements. Breaking the attributes into small categories like this simplifies the task of creating the media pool and helps make the table itself a bit more legible. At this point, observe Figure 9, which shows a sample completed media pool. Note how the media are listed down the left-hand column, and the attributes are listed across the top row, creating a media-by-attributes matrix. Creating such a table allows the next phase to proceed.

c. Cross-Reference Media and Their Attributes. For each medium listed, the analysts will then weight its ability to deliver each instructional characteristic. The weighting is made with a single number, between 0 and 5. A "0" weighting indicates that the medium has no capability for delivering an instructional attribute. A "5" indicates that the medium is very capable of handling a particular characteristic. Note in Figure 9 that the medium "audio-tape" is ranked "5" under the attribute "audio-voice," indicating the strong relationship between the two. "Workbook," of course, is ranked "0" under the audio-voice capability, since it has no ability for delivering this characteristic.

The user of the system has the option, of course, to use any media or any instructional characteristic relevant to the needs of the project at hand. Other instructional characteristics which might be used in the data base include availability of equipment, cost of equipment, task difficulty, stage-of-learning,

MEDIA LISTED ON THE FILE : pool

1. CAI
2. Random Access Slides
3. Motion Picture/ Videotape
4. Slides/Audio
5. Audio/Tape
6. Slides
7. Lecture
8. Demonstration
9. Group Discussion
10. Workbook
11. Teaching Machine
12. OP. Equip./OP. Environment
13. OP. Equip./Lab
14. Team Trainer
15. Procedural Trainer
16. Part Task Trainer
17. 3-D Mock-up
18. 2-D Mock-up
19. TICCIT + Videodisc
20. PLATO + Videodisc
21. GETS
22. Besseler Cue-See

Figure 7. A sample media listing.

ATTRIBUTES LISTED ON THE FILE : pool

* I. DISPLAY CHARACTERISTICS
1. Audio (voice)
2. Audio (ambient)
3. Tactile cues
4. Kinesthetic cues
5. Verbal/text
6. Pictorial
7. Drawings/diagrams
8. Motion
9. Color
* II. RESPONSE MODE
10. Verbal/written
11. Point-touch-mark
12. Manipulate
13. Multiple choice
* III. EVALUATION
14. Instructor
15. Automated
16. Peer
17. Intrinsic
* IV. FEEDBACK
18. Immediate response
19. Immediate error
20. Periodic
21. Post session
* SPECIAL REQUIREMENTS
22. Crew/team interaction
23. Environmental condition
24. Physical motion
25. Time variability

Figure 8. A sample listing of instructional characteristics.

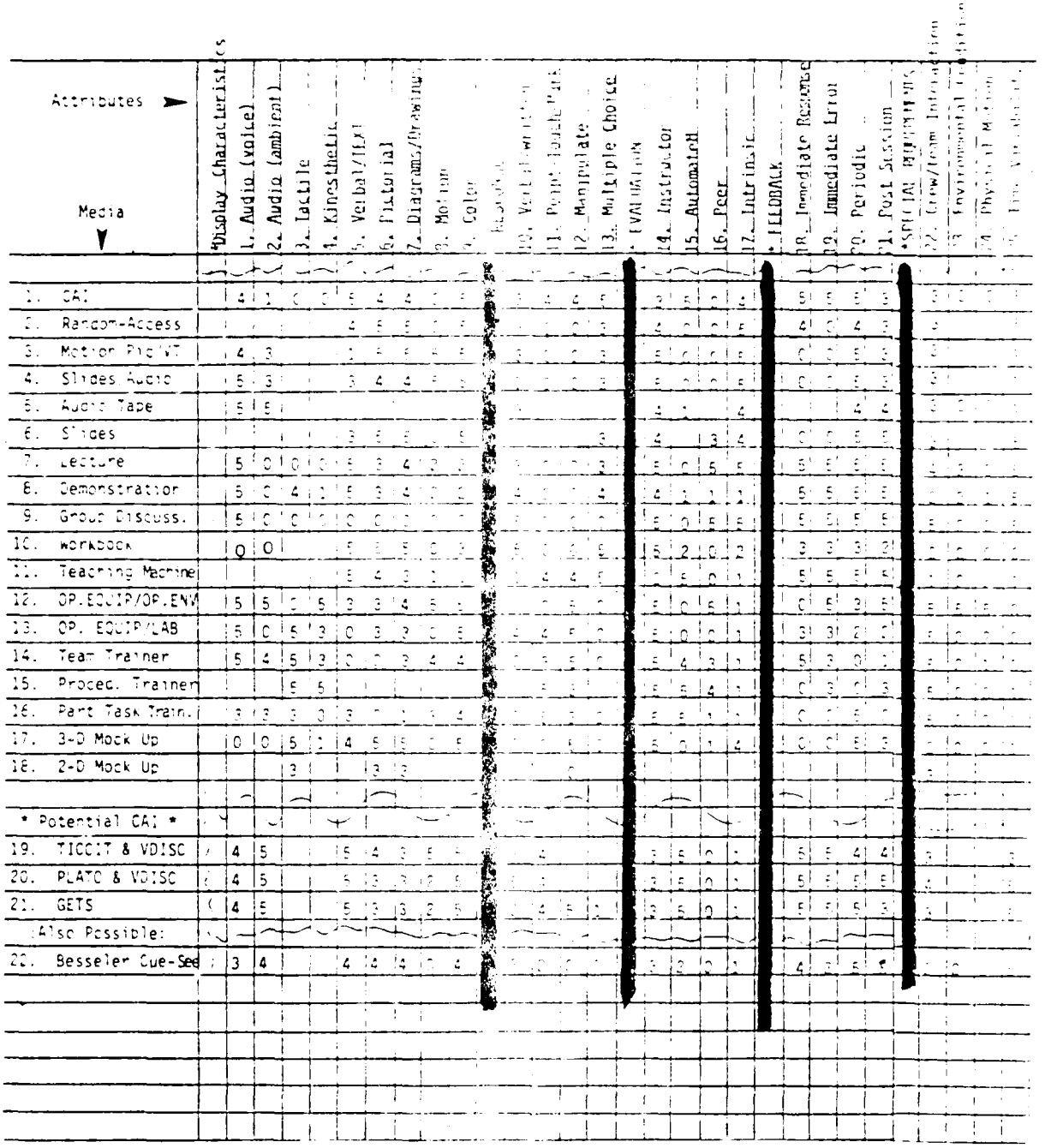

Figure 9. A sample completed media pool with each medium's ability to deliver each characteristic rated on a 0-5 scale.

or task frequency, to name a few. For instance, CAI, would probably be ranked "0" under the attribute "low cost," or "5" under the characteristic "availability" should one be available at the proposed training site. Similarly, actual equipment and simulators might rate high on the dimensions of "task difficulty" or "task frequency," so that the more difficult and frequent tasks are assured simulator training. The instructional attributes do not have to relate to effectiveness variable per se and this is why trade-offs involving cost, availability, reliability and other factors are possible.

Once the media pool has been created, it needs to be entered into the computer as a data base. The AIMS system provides programs to allow easy entering of these data. The User Guide details the procedures. Once that task is complete, the user needs to create selection worksheets for matching instructional characteristics to objectives. The system provides for automatic generation of such a worksheet. The worksheet, of course, is directly tailored to the media pool from which it was created. Figures 10 and 11 show selection worksheets from two different media selection problems which were produced by the computer. AIMS assists in the Information Analysis function of media selection by reducing the time to record and store the results of learning objectives analysis. It should be noted also that, while we speak of learning objectives analysis here, the analysis could be based on sets of objectives, generic objectives, hardware functional analysis, mission analysis or any other information. This allows one to use the system regardless of the state of front-end analysis, as will be detailed later.

As in models discussed earlier in the report, the instructional designers/developers need to use the worksheets to indicate the instructional characteristics required for effective and efficient delivery of instruction. Since this is a judgmental, "thinking" task, the worksheets are provided to allow designers to work "off-line," not consuming unnecessary computer time at this stage.

Once all of the instructional characteristics for a given group of objectives have been determined, these data need to be entered into the computer. This is an easy task; complete instructions are provided in the User's Guide. Basically, the person inputting data, (a fast 10-key operator might be best), types in the objective number and the numbers of the instructional attributes checked off on the worksheet for that objective. The computer then goes to work in several ways:

a. Determines media which have the required characteristics.

b. Determines how <u>well</u> each medium handles required characteristics.

c. Scores and rank orders media as to their appropriateness for the given objective.

d. Records how many times each medium is selected.

e. Stores objectives with selected media on data base of objectives.

The computer performs these tasks many hundreds of times faster than would be humanly possible.

SELECTION WORKSHEET FOR USE WITH THE FILE : pool

OBJECTIVE NUMBER : _____

OBJECTIVE:

_____

_____

Put a check in the boxes next to required attributes.

* I. DISPLAY CHARACTERISTICS
- |__| 1. Audio (voice)
- |__| 2. Audio (ambient)
- |__| 3. Tactile cues
- |__| 4. Kinesthetic cues
- |__| 5. Verbal/text
- |__| 6. Pictorial
- |__| 7. Drawings/diagrams
- |__| 8. Motion
- |__| 9. Color

* II. RESPONSE MODE
- |__| 10. Verbal/written
- |__| 11. Point-touch-mark
- |__| 12. Manipulate
- |__| 13. Multiple choice

* III. EVALUATION
- |__| 14. Instructor
- |__| 15. Automated
- |__| 16. Peer
- |__| 17. Intrinsic

* IV. FEEDBACK
- |__| 18. Immediate response
- |__| 19. Immediate error
- |__| 20. Periodic
- |__| 21. Post session

* SPECIAL REQUIREMENTS
- |__| 22. Crew/team interaction
- |__| 23. Environmental condition
- |__| 24. Physical motion
- |__| 25. Time variability

Figure 10. A sample selection worksheet from a media pool entitled "Pool."

SELECTION WORKSHEET FOR USE WITH THE FILE : b:dass

OBJECTIVE NUMBER : _____

OBJECTIVE:

_____

_____

Put a check in the boxes next to required attributes.

*I. VISUAL DISPLAYS
- |__| 1. single/clear classic
- |__| 2. single/clear incomplete
- |__| 3. multiple/clear classic
- |__| 4. multiple/clear incomplete
- |__| 5. single/clear confusing lines
- |__| 6. single/peculiarities
- |__| 7. multiple/clear confusing lin
- |__| 8. multiple/peculiarities

* II. AURAL DISPLAYS
- |__| 9. single/clear classic
- |__| 10. single/clear incomplete
- |__| 11. multiple/clear classic
- |__| 12. multiple/clear incomplete
- |__| 13. single/clear confusing
- |__| 14. single/peculiarities
- |__| 15. multiple/clear confusing
- |__| 16. multiple/peculiarities

*III. RESPONSE
- |__| 17. communication: Senso
- |__| 18. communication:TACCO
- |__| 19. communication: pilot
- |__| 20. communication:
- |__| 21. tactical procedures
- |__| 22. analysis: non-console
- |__| 23. analysis: console
- |__| 24. display option
- |__| 25. multiple sonobuoy monitorin
- |__| 26. non-operating response

*IV. MEASUREMENT
- |__| 27. overtimes
- |__| 28. console error events
- |__| 29. non-console error events
- |__| 30. non-operating error events
- |__| 31. GALT sequence
- |__| 32. debrief replay
- |__| 33. time and success summaries
- |__| 34. display option
- |__| 35. multiple sonobuoy monitorin

*V. STRATEGIES
- |__| 36. interaction:Senso
- |__| 37. interaction: TACCO
- |__| 38. interaction: pilot
- |__| 39. interaction: other
- |__| 40. overtime feedback
- |__| 41. console error feedback
- |__| 42. non-console error feedback
- |__| 43. non-operating error feedbac
- |__| 44. change LOFARgram difficulty
- |__| 45. replay
- |__| 46. skip event
- |__| 47. freeze
- |__| 48. time compression

*VI. ADDITIONAL ATTRIBUTES
- |__| 49. visual data display
- |__| 50. aural data display

Figure 11. A sample worksheet from a media pool entitled "DASS."

Figure 12 shows a sample media selection made by the AIMS model. Note that the media are ranked according to "specific" rating. This is a rating of how well this medium handles the characteristics specific to the objective. The "general" rating is the average of the quality ratings assigned to all of the instructional characteristics for that medium. A comparison of these ratings indicates the degree to which the capabilities of that medium can be exploited for a given objective. For example, the first choice in Figure 12, "Op.Equip/Op. Environment," shows that the medium's attributes matched up with attributes required by the objective for a highest "specific" rating of "5." The general rating (average of all ratings), however, for this medium, was 4.46. In this case, the medium's attributes matched the requirements of this objective very well. The opposite was true of medium choice #6, "2D Mock-up." In this case, the average general rating for the medium was 3.36, but for this specific objective the rating was 1.33, showing that the attributes of the medium did not match well to those required by the objective.

GOALS OF AIMS

Like all other human activities requiring analytic thinking, media selection can be proceduralized and automated only to a limited extent. ISD personnel must always remember that the system is only as useful as their analytic abilities are able to exploit it. The following discussion of the five goals of the AIMS system is provided to further explain the power of AIMS to assist ISD personnel. It is beyond the current scope to include step-by-step procedures for the examples below. They are intended only as hints and clarification to the AIMS user.

MAXIMIZE THE USE OF PERTINENT INFORMATION. Any given problem may be approached by gathering and using all relevant information or by simplifying the effort using a small subset of information. Media models in the literature reflect from one end of the continuum "information use" to the other. Either approach is possible with AIMS because the user defines how much information is relevant as part of the problem analysis. The user determines which and how many attributes should be derived from the analysis of objectives. The user determines what should be included in the media pool. The user decides whether an existing media selection model such as those reviewed earlier satisfies the problem criteria.

A major advantage of the AIMS system is that large amounts of information (attributes, media pool items) can be efficiently input into a computer-managed data base and utilized at a tremendous time savings over a manual effort. In fact, when a large amount of information is used manually it can be unwieldy, especially difficult for those without extensive media expertise, and time consuming. The AIMS system allows the user to define the specific media selection model required during the problem analysis and definition steps. Information analysis is then aided by allowing the user to input the coded analysis of objectives into the data base instead of having to sift through them one by one to perform matching and trade-offs. Likewise, because all information is now on the data base the right command matches the analysis results for each objective with each medium, summarizes each medium's rank across objectives, and prints out the results in tabular form. Trade-offs can easily be made by adding or changing attributes or media to reflect a modification of the problem statement (e.g., what if we eliminate this instruction that requires significant amounts of audio? or, if we change the

OBJECTIVE #2.2.3.4.2.0

MEDIUM	SPECIFIC RATING	GENERAL RATING
1. Op. Equip./Op. Environment	5.00	4.48
2. Op. Equip./Lab	4.33	4.85
3. Procedural Trainer	4.33	4.85
4. Part task trainer	3.67	4.18
5. 3D Mock-up	3.67	4.36
6. 2D Mock-up	1.33	3.36

Figure 12. A sample media selection made by the AIMS model for a single objective

instructional setting to a deployed site instead of a schoolhouse classroom, should we eliminate media which cannot be supported easily?)

Most of the labor in matching and trade-offs is computerized. It is performed at a fraction of the time required if ISD personnel were to do the same thing manually. Because of the efficiency added by AIMS, the user can design the media selection model to meet the problem with much less concern as to how much information to include and, thereby, maximize the information pertinent to media selection.

PROVIDE FLEXIBILITY TO MODIFY THE MODEL. One problem with many media models is that all media selection problems are treated equally. The models imply that the same attributes and media pool can be used for almost all problems. This is not true. For example, one situation may be concerned only with selecting from currently available media which can be supported by existing in-house resources; while another case, starting without any support resources or restrictions, may be open to all possible media.

AIMS provides flexibility by allowing the user to change the media pool and/or the media attributes. For example, the user may wish to add a particular medium to the list (emerging videodisc system) or add a capability assigned to a particular medium (touch panel to a computer assisted instruction system). These user functions suggest the need to update, change, and add to the media selection data base. The recurring problem with current media selection models is the broadness of the media selections and the rigidity of the media pools. The possibility of creating a universal media pool seems nil. Media pools are going to vary in terms of the media to be considered, the relevant instructional characteristics, the level of specificity, and changing technologies and media formats.

Without any special programming expertise, the AIMS user may add or change media and attributes, or create entirely new media pools, without compromising the selection process itself. The emphasis on flexibility in the AIMS system makes it widely applicable to a variety of training system development projects. It satisfies the requirements for growth potential and allows for fulfillment of the next three goals to be discussed.

CONSIDER STUDENT STAGE OF LEARNING. There is an overlap between this goal and the goal of allowing better selection capability for hands-on training devices. Generally, as the stage of learning becomes more advanced there are more requirements for hands-on training. By identifying the stage of learning first, selection may be directed toward the applicable hands-on training requirements. Procedures for using AIMS to consider student stage of learning are illustrated below with three examples. Section IV of this report also provides an example of a situation considering stage of learning which was implemented on AIMS. Specific attributes of hands-on training devices as they relate to media selection using AIMS are discussed under Goal 4.

To consider stage of learning in the media selection process, the concept is incorporated as an instructional characteristic which then enables the computer to select media on that characteristic. The User's Guide in

the Appendix provides the necessary step-by-step information for adding instructional characteristics to the media pool. However, the definition of student stages of learning is dependent upon the training system and instructional developers.

In one example, the stages of learning at a fleet readiness squadron could be defined as: (1) familiarization, (2) memory, and (3) actual use, with additional substages defined by the content of information to be remembered and used. Substages are thus often defined as facts, concepts, rules and procedures. This scheme, or a variation of it, has been used in several Navy aircrew curricula developments to classify learning objectives. After these attributes are included in the data base, each medium in the pool would be rated by how well it could provide for each stage of learning. For example, a simplified diagram of an operator's console might be usable for familiarization, a workbook and technical manual for acquisition of information, and a simulator trainer for using the information under various conditions.

The LAMPS MARK III model described in Section II provides another example of determining student stage of learning. In this model, the first step is to classify the objective as either "hands-on" or cognitive. In the second step, the level of learning for each hands-on objective is determined. As shown in Table 2 in the left column, there are five levels of learning for "hands-on" objectives.

The levels of learning are then used to prioritize the media selected. Table 3 represents a priority assignment table used for training devices. The letters across the top pertain to: (A) operational equipment-operational environment, (B) operational equipment-laboratory equipment, (C) team trainer, (D) procedural trainer, (E) part-task trainer, (F) three-dimensional mock-up, and (G) two-dimensional mock-up.[17] The numbers indicate the rank (from 1-7 with 7 the lowest) of a device's capability to provide the training for a level of learning based on the "complexity/fidelity" required and procurement costs.

The TAEG model described in Section III provides yet another example of stage of learning analysis which could be implemented on AIMS. It illustrates different techniques for taking into account stages of learning than those used in the LAMPS MARK III model. The TAEG model makes the distinction between training stages and training tasks. Each stage consists of fundamentally similar tasks. Stages are ordered so that prerequisite skills are acquired before advanced skills are introduced. The training tasks are therefore organized into a preliminary curriculum outline which should consist of a series of stages. Table 4, taken from the TAEG report, illustrates the dual categorization by both stage and tasks within a stage. Note that tasks within a stage (center column) also consist of two or more primary task categories which indicate the type of learning required. The procedures for selecting the appropriate media include:

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[17] See footnote 7 on page 11.

TABLE 2. "HANDS-ON" LEARNING LEVELS USED IN LAMPS MARK III MEDIA SELECTION MODEL

Classification	Typical Verbs	General Description
Familiarity	Identify, Select, Locate, Touch, List	The trainee learns general context knowledge of the job and mission to be implemented and will learn to identify, locate, perceive the inter-related personnel, equipment, and material with which he will interact.
Perform Procedure	Configure, Remove, Assemble, Assign, Retrieve, Prepare, Inspect, Open, Close	The trainee learns the sequences, movements, and mental processes to be followed in order to perform elements of his job. These procedures are generally learned to an unaided but elementary skill level.
Perform Job	Classify, Track, Launch, Fly, Land, Repair, Fix, Transmit, Decide, Align, Operate, Control	The trainee learns to perform all procedures, processes, and decisions required in a job at a skill level required operationally. This type of of learning involves varied job experiences and related concurrent activities.
Perform Mission	Comply, Order, Acknowledge, Confirm, Request, Report, Relieve, Share, and Combined Action Verbs	The trainee learns to perform the job in coordination and communication with, dynamic interaction with, other functional personnel (real or simulated). This type of learning requires highly proficient job skills for effective training.
Perform Under Unusual/Degraded Conditions	Verbs are similar to Perform, Job, Mission. Conditions must be evaluated.	The trainee learns to cope with the unexpected and unusual events that may occur in operation such as equipment malfunction, incorrect information, short handed, extraordinary environments. This type of learning also has as a prerequisite highly proficient job skills.

TABLE 3. PRIORITY ASSIGNMENT "HANDS-ON" MEDIA POOL IN LAMPS MARK III MEDIA SELECTION MODEL.

	A	B	C	D	E	F	G
Familiarity	7	3	6	5	4	2	1
Procedural Performance	7	5	6	4	3	2	1
Job Performance	4	5	3	1	2	6	7
Mission Performance	2	5	1	3	4	6	7
Unusual Event	2	7	1	3	4	5	6

TABLE 4. CATEGORIZATION OF TASKS IN THE FAMILIARIZATION STAGE IN THE TA-4J ADVANCED JET NAVY UNDERGRADUATE PILOT TRAINING PROGRAM.

Stage	Tasks Within Stage	Primary Task Categories
Familiarization	Cockpit Procedures	Recalling Procedures Non-Verbal Identification Positioning & Serial Movement
	Preflight Inspection	Recalling Procedures Non-Verbal Identification Making Decisions
	Normal Operating Procedures	Recalling Procedures Non-Verbal Identification Continuous Movement Positioning and Serial Movement
	Nosewheel Steering and Taxi Procedures	Recalling Procedures Non-Verbal Identification Continuous Movement Oral Verbalization
	Take-Off/Climb/Level Off	Recalling Procedures Non-Verbal Identification Continuous Movement Positioning and Serial Movement Oral Verbalization
	Aerobatics	Recalling Procedures Non-Verbal Identification Continuous Movement
	Landing	Recalling Procedures Non-Verbal Identification Continuous Movement Positioning and Serial Movement Oral Verbalization

a. Identifying the stage and task type

b. Determining the guidelines and media implications for the different learning task categories, and

c. Matching the implications to options in the media pool.

Details of each step may be found in the TAEG staff study report.[18]

ALLOW MORE DETAILED SELECTION OF TRAINING DEVICES. Since each user can create his own media pool, extensive listings of simulators, actual equipment, and other hands-on type media and their attributes are fully permissible. Fidelity requirements can be included as instructional characteristics, thereby directly bearing on the media selected. The bias toward cognitive type media which is apparent in existing models can be eliminated.

Media selection models do not usually provide procedures for determining specific simulator requirements and matching objectives to simulators to be used for training. If selection criteria are identified, they are not usually comprehensive. The AIMS approach provides a tool for systematic selection of simulators as well as other media. The use of stage of learning attributes and the definition of specific attributes required for displays, responses and other learning task elements are important in selecting simulators.

The key to determining when and how simulators should be designed and used in training is in the concept of level of fidelity. Gagne's definition is:

> "A simulator is generally understood to be a kind of training device which has a high degree of resemblance to operational equipment, particularly with respect to the display, the controls, and the way one affects the other when in operation."[19]

According to Gagne, training simulators have three characteristics in common, each of which is related to fidelity and must be taken into account in media selection. The characteristics are:

a. A representation of the real situation in which operations are carried out

b. A way to provide desired controls over the represented situation

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[18] See footnote 4 on page 10.

[19] R. Gagne, Training Devices and Simulators: Some Research Issues AFPTRC-TR-54-16. (Lackland AFB, TX: Air Force Personnel and Training Research Center, Air Research and Development Command, May 1954).

c. The omission, by design, of certain parts of the real situation.[20]

The key question in decisions of when and how to use a simulator in training is how much representation to provide. Costs, availability of real equipment, and other practical factors enter into final media mix decisions, but these are factors to be considered at a later stage rather than during the analysis of training requirements. As pointed out in previous work for the NAVTRAEQUIPCEN,[21] there are some guidelines for developing and using simulators, but they have not been formally proceduralized within the ISD process.

The concept of the AIMS system is to allow the user to incorporate specific information on skills training and simulation which requires higher fidelity than that available with general media. Ultimately, the user must decide how much information to incorporate to satisfy the training situation. Figure 13 provides a methods/media framework suggested as a model for the AIMS user. This framework uses many of the same general ideas as the LAMPS MARK III model described earlier. However, the AIMS system should provide improvements by allowing for more detailed selection of training devices in each unique training program.

The following paragraphs provide a brief explanation of the five steps shown in Figure 13. Where appropriate, statements concerning training simulator literature are made to assist the AIMS user in the problem analysis and definition functions. Section IV illustrates how specific fidelity requirements were handled for a demonstration project using AIMS.

Step 1 - Analysis of Objectives. Tilden[22] pointed out that the degree of fidelity required for simulators is a consequence of the training objectives and what is known about how to train the objectives (referred to as learning theory). In this case, learning theory means what is known about information presentation, perception, feedback, motivation, transfer of learning, and other methods/media issues. However, the major question to be answered is how to relate fidelity requirements to a training objective.

The first step in the LAMPS MARK III model is the analysis of objectives for a "hands-on" requirement. The hands-on decision is made by determining if a representation or a real display or response feature is required. The model proposed here carries this notion further in order to utilize more of the relevant information which can be derived from analyzing objectives. The user should analyze the three components of each objective (behavior, standard, conditions) since each of these components provides relevant fidelity information. Conditions tell us something about display requirements. For

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[20] See footnote 19 on page 46.

[21] W. W. Prophet, U.S. Navy Fleet Aviation Training Development, NAVTRAEQUIPCEN Technical Report 77-C-0009-1. (Pensacola, FL: Seville Research Corporation, March 1978).

[22] C. H. Tilden, Problems in Training Equipment Design, (North American Aviation, Inc., Space and Information Systems Division, 1962).

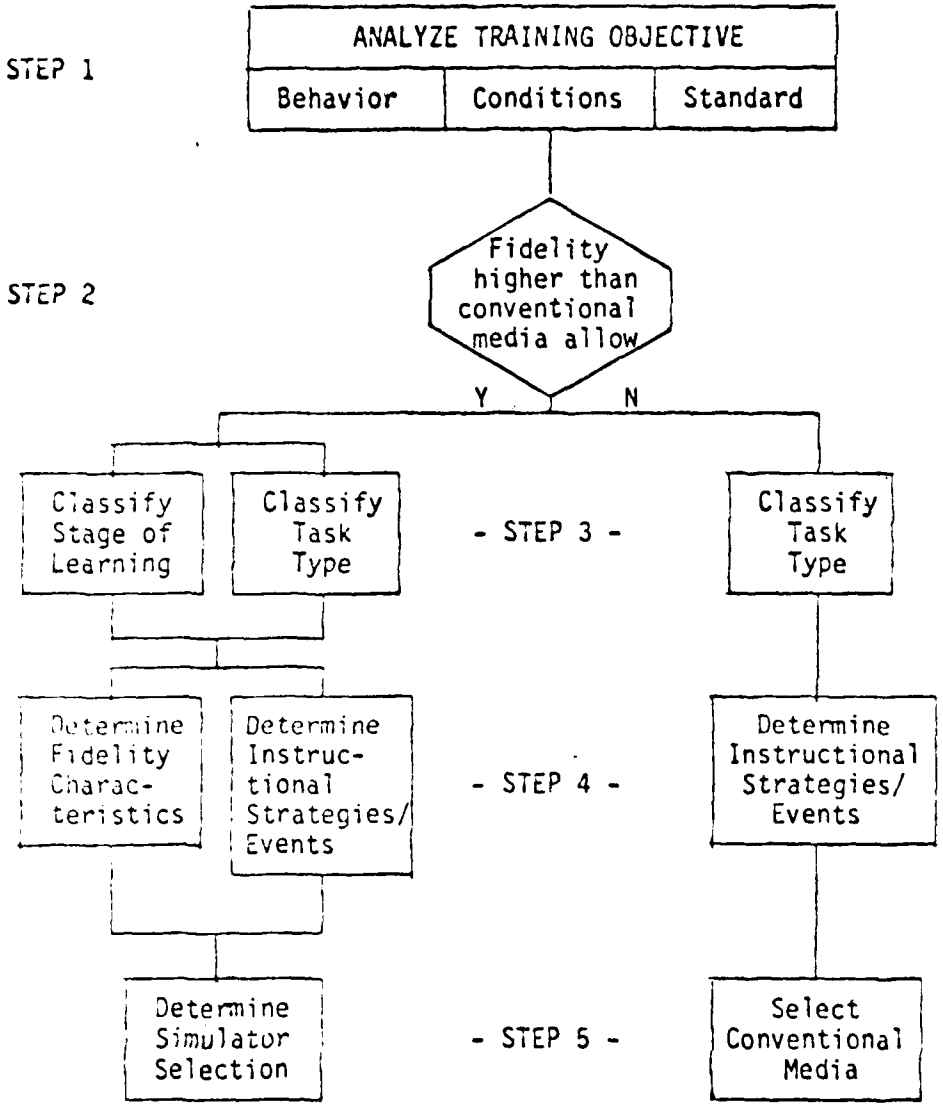

Figure 13. Summary of proposed methods/media selection.

example, if a LOFARGRAM with visual cues for primary harmonic family is indicated in an objective, then the display fidelity must be high regardless of the presentation medium. Standards provide information related to response and recording (performance measurement) requirements. The behavior tells us something about interactiveness and general response mode.

Step 2 - Fidelity Level. By identifying the fidelity requirements for the objectives, the user can then determine whether training devices or simulators are required. In some cases, it will be possible for both training devices and classroom media to perform for a given objective. Step 2 requires only that a decision is made that higher fidelity is required than available with conventional media. The detailed requirements will be used later in Steps 3 and 4.

Step 3 - Classification. In a typical classroom media selection model, the classification of objectives by learning type is part of the ISD procedures. This step also exists in the AIMS model. It is suggested that classification by stage of learning also be done where the learning objectives indicate a higher fidelity device may be required.

A variety of classification schemes has been used by practitioners. The categories used in the LAMPS MARK III and TAEG/TECEP procedures were described earlier in this report. The categories may be as simple as "early," "middle," and "high" stages. The categories may be defined by agreement that a specific task belongs to a category. Definitions of categories which are totally clear may be difficult to achieve.

Step 4 - Determine Strategies/Events. Stages of learning are relevant to selections involving trainers and real equipment because they aid in determining the need for three aspects of fidelity discussed by Kinkade and Wheaton.[23] These are: (1) equipment fidelity, (2) environment fidelity, and (3) psychological fidelity. These three aspects of fidelity relate to the design of the trainer and control of the representations. By incorporating the relevant fidelity factors for a training situation into the media pool and attributes data base definition, the user can provide for more detailed selection of training devices and simulators.

Research done on how fidelity factors relate to stages of learning indicate:

a. At later stages of learning, specific factors are required peculiar to the stage.[24]

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[23] R. G. Kinkade and G. R. Wheaton, "Training Device Design," in Human Engineering Guide to Equipment Design, ed. H. P. VanCott and R. G. Kinkade (Washington, DC: American Institutes for Research, 1972).

[24] E. A. Fleishman, "The Description and Prediction of Perceptual-Motor Skill Training," in Training Research and Education, ed. R. Glaser (Washington, DC: Office of Naval Research, 1961).

b. As the skill level proficiency is expected to increase, the fidelity of the learning environment should increase.[25]

c. In early stages of learning, (such as learning nomenclature) a high fidelity learning environment is inefficient[26] and may actually confuse the trainee.[27] An exception to this might be the learning of complicated motor skills where the training device is designed to accommodate varying levels of proficiency.[28]

d. As the student enters a "middle" stage-of-learning (more task integration and higher expected proficiency) fidelity increases for such factors[29] as:

(1) Noise which must be learned as irrelevant

(2) Guiding cues for action

(3) Discrimination cues

(4) Time relationships

(5) Task and event loads

e. In high (final) stages of learning, fidelity should be increased still more for each of the factors under "d" above.[30] Practice should simulate with accuracy the operational environment where such factors are the basis for task performance.

Step 5 - Selection. The final step is to list and prioritize the trainer and conventional media options which meet the training objectives requirements.

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[25] R. G. Kinkade and G. R. Wheaton, "Training Device Design," in Human Engineering Guide to Equipment Design, ed. H. P. VanCott and R. G. Kinkade (Washington, DC: American Institutes for Research, 1972).

[26] R. B. Miller, Psychological Considerations in the Design of Training Equipment, WADC-TR-54-563(AD-71 202), (Wright Air Development Center, Wright-Patterson AFB, OH, December, 1954).

[27] G. G. Miller, Some Considerations in the Design and Utilization of Simulators for Technical Training, AFHRL-TR-74-65 (Lowery Air Force Base, Colorado, Human Resource Laboratory, August, 1974).

[28] R. Gagne, Training Devices and Simulators: Some Research Issues, AFPTRC-RT-54-16. Lackland AFB, TX: Air Force Personnel and Training Research Center, Air Research and Development Command, May 1954.

[29] E. A. Fleishman, "The Description and Prediction of Perceptual-Motor Skill Training," in Training Research and Education, ed. R. Glaser (Washington, DC: Office of Naval Research, 1961).

[30] Ibid.

ALLOW FOR VARIATIONS IN THE STAGE OF FRONT-END ANALYSIS. The conventional thinking behind media selection models is that they are used by a combination of instructional designers and media specialists during instructional development. Usually included in the "use" scenario is the assignment that a job/task analysis has been performed with objectives defined and arranged in a fashion indicating instructional sequence.

The problem arises during the conceptual stage of new weapon system programs when this information is not available and only gradually becomes available as the front-end analysis for training is performed. Yet program managers must make decisions, prior to a full front-end analysis, for training plans which include billet, budgetary, and support resource requirements. At least tentative decisions must be made early in a program on media (including training devices) utilization. In many cases, this has been an almost impossible task which is resolved in an armchair mode with best guesses and little supporting rationale due to the lack of information.

As seen in Figure 14, there are two types of information: (1) task statements and (2) behavioral objectives. Each of these two information types has three possible levels of quality: (1) completely analyzed for all tasks or objectives (full), (2) analyzed only for what are identified as new or unique system functions (system specific), and (3) general (generic) task statements which could apply across various aircraft as derived from CASDAT (or some other source if it exists for a non-aircraft system). In the best situation, a full task analysis and full behavioral analysis would be available on which to base the media selection. As one or both of the information types becomes lower in quality, from completely analyzed to system specific only to generic, a grosser determination of media requirements is made. Figure 14 illustrates the level of media selection specificity that might be obtained, depending upon the quality of information available.[31]

It is possible to make a media selection, regardless of the information quality, using AIMS. During the problem analysis, the AIMS user should determine what level of information is available. The AIMS system does not know the difference, but the user should. If the level of information to be used for media/attribute requirements is at the mission phase, equipment function, or some other gross level, then the definition of the attributes and media pool data base may not have to be extremely detailed. How detailed the data base should be is subject to the preference of the user, based on the problem. Typically, in the early stages of weapon system development, only estimates are needed and media selection will be finalized later based on a full front-end analysis. However, if the early selection is likely to determine the actual media, then the user should be as detailed as possible in defining the attributes and media pool data base.

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[31] J. Funaro, "Front-End Analysis (FEA) for Emerging Weapon Systems," paper presented at the DoD/DARPA Conference, Santa Fe, NM, September 1979.

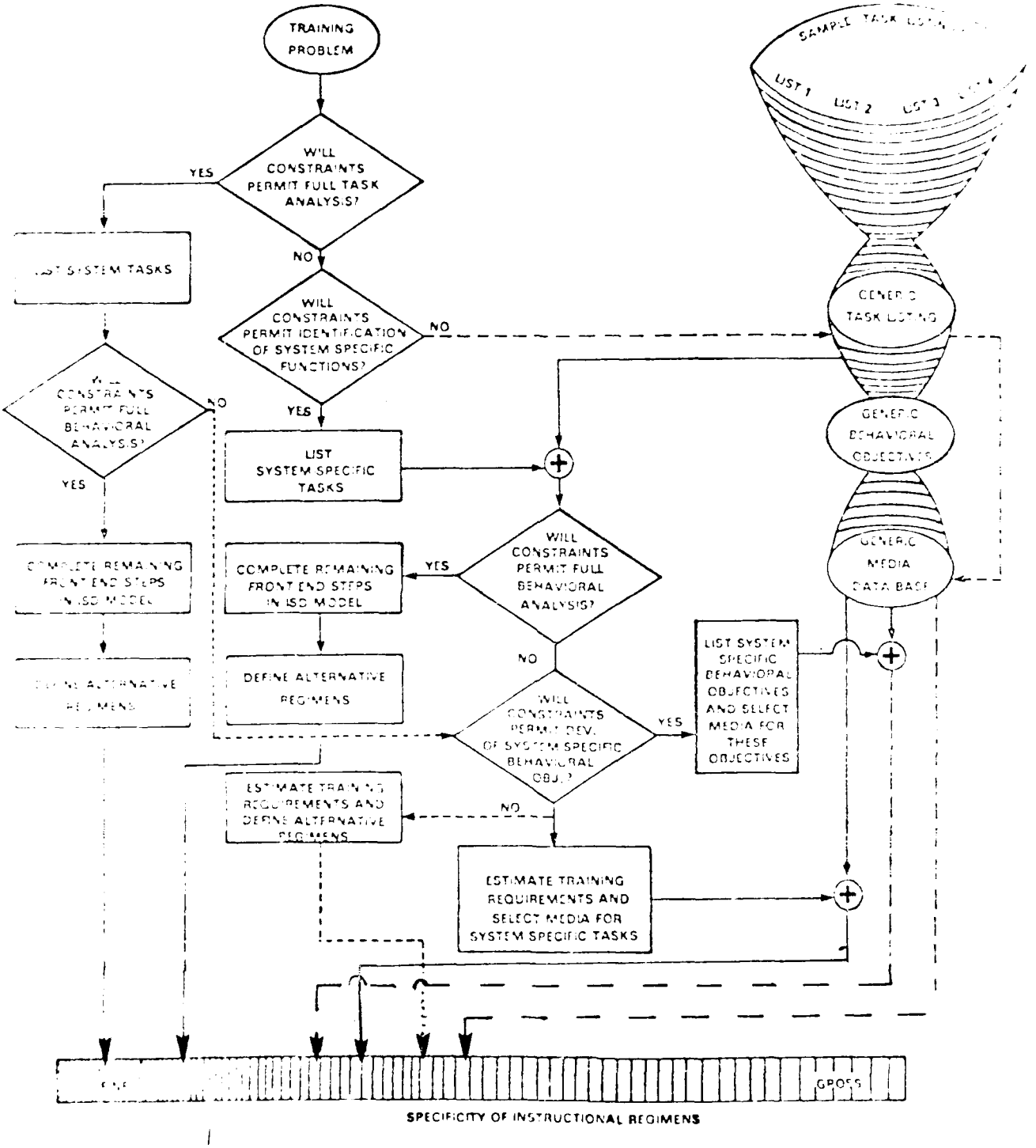


Figure 14. Level of specificity of media selections and stage of front-end analysis.

SECTION IV

DEMONSTRATION OF THE MODEL

As part of an ongoing project, Instructional Science and Development, Inc. was tasked to select media for an acoustic sensor operator deployed training system (DTS). The project represented a unique media selection problem. The training required high fidelity displays so a trainer capability or real equipment was required. However, no trainer already existed which could satisfy the requirements. The problem illustrates how Goal 3, consideration of stage of learning, and Goal 4, more detailed selection of hands-on training devices, can be handled with AIMS. The purpose of this section is to provide an example of how the AIMS system was used and the general outcomes of this application. The description is organized by the five major functions of media selection defined earlier.

PROBLEM ANALYSIS

A review of media selection models, such as the Interservice Procedures Model for Instructional System Development, did not result in finding an existing model which was deemed suitable. An approach to media selection which was highly specific to the acoustic sensor operator training problem statement was desired. Most media selection algorithms are more concerned with academic or learning center type media. In addition, the instructional characteristics which are used to describe the media are general in nature. Typically, they include the type of visual (still or motion; color or black and white; pictures or drawings), audio (voice or sound), and other general type characteristics. Furthermore, most media selection models do not specifically take into account stages of learning and advanced proficiency measurement. Therefore, it was determined that a procedure which provided for specific fidelity of display and response decisions, as well as the other detailed requirements of a deployed training system, was required.

DEFINITION

Table 5 lists the instructional characteristics which were determined to be relevant to DTS media selection. The characteristics are specific to the job of acoustic sensor operator and the training that job requires. Note that the instructional characteristics are categorized by display, response, measurement, and instructional strategy requirements.

The display requirements were taken, in part, from the current procedures for measuring proficiency of acoustic sensor operators. The proficiency measures cite the complexity and clarity of displays during analysis. Eight proficiency levels for analyzing acoustic data from visual and aural data were used to define the visual and aural display characteristics. The eight items listed under each of the categories Visual Displays and Aural Displays are abbreviated names for the proficiency levels. The proficiency levels and associated display requirements are a function of the type of target, its clarity, and number of signatures being analyzed. Although the eight proficiency levels are not exactly hierarchical they are still a stage of learning indicator and reflect a categorization recognized by operators.

TABLE 5. INSTRUCTIONAL CHARACTERISTICS FOR DTS MEDIA SELECTION

VISUAL DISPLAYS
1. single/clear classic
2. single/clear incomplete
3. multiple/clear classic
4. multiple/clear incomplete
5. single/clear confusing lines
6. single/peculiarities
7. multiple/clear confusing lines
8. multiple/peculiarities

AURAL DISPLAYS
9. single/clear classic
10. single/clear incomplete
11. multiple/clear classic
12. multiple/clear incomplete
13. single/clear confusing
14. single/peculiarities
15. multiple/clear confusing
16. multiple/peculiarities

RESPONSE
17. communication Senso
18. communication: Tacco
19. communication: pilot
20. communication: other
21. tactical procedures
22. analysis: non-console
23. analysis: console
24. display option
25. mult. sonobuoy monitoring
26. non-operating response

MEASUREMENT
27. overtimes
28. console error events
29. non-console error events
30. non-operating error events
31. GALT sequence
32. debrief replay
33. time and success summaries
34. display option
35. mult. sonobuoy monitoring

STRATEGIES
36. interaction: Senso
37. interaction: Tacco
38. interaction: pilot
39. interaction: other
40. overtime feedback
41. console error feedback
42. non-console error feedback
43. non-operating error feedback
44. change LOI
45. replay
46. skip event
47. freeze
48. time compression

ADDITIONAL ATTRIBUTES
49. visual data display
50. aural data display

The response requirements included actions taken at a console, as well as actions which would normally be part of the operator's job but not related to the console procedures. For example, instructional characteristics were included which relate to the interaction between acoustic sensor operator and other crew members, since concern was expressed about the need for subteam or team type interaction.

These types of responses are also reflected in the instructional characteristics categorized under measurement. It was considered important to be able to measure the sequence of actions, the timeliness of the actions, and the success of the actions taken. The instructional characteristics in the measurement category relate directly to the display and response characteristics.

Finally, the instructional characteristics related to training strategies are listed. Included are diagnostics on overtimes (beyond acceptable standards in objectives) and errors of several possible types as well as feedback capability for these errors. The capability is included for instructor actions during real time playing of the scenario. Freezing the exercise when a trainee has accomplished the objective and there is no sense in continuing to run the exercise, and replaying some portion of the exercise to reinforce or provide for practice are seen, in Table 5, as examples of instructor actions which could be required.

The media pool for training of acoustic sensor operators at an advanced level of proficiency need to reflect the entry level into the training and the constraints of the training environment. The entry level of the students is fairly high. The acoustic sensor operator, at a deployed setting, has been performing his job for some period of time in the actual environment. The training media must have a fairly high level of fidelity because the operator's job is dependent upon the console display of lines representing ocean acoustics. It was determined earlier that the analysis phase of the acoustic sensor's job was the most critical for training. Therefore, it became important for the incoming information, both visual and aural, to be of sufficient fidelity during training to transfer to the analysis phase of the job. In addition, it did not seem necessary to have a media pool with such commonplace learning center media as audio tapes, slide/sound, filmstrip, or other audiovisual devices. It was more suitable that the deployed training system have support media more in tune with storage and operation limitations. Some of the deployed settings are on board ships which have little or no extra room. Therefore, support media such as printed material, both for students and instructors, were considered more appropriate. The instructors themselves were also included as part of the support media since they play an important part in the actual instructional events as well as the evaluation and management of training.

A meeting was held with personnel from the Navy Personnel Research and Development Center (NAVPERSRANDCEN), the Naval Air Development Center (NAVAIRDEVCEN), and the contractor to define possible alternatives for delivering the instruction. Six alternatives, based on three different hardware/software technologies, were defined with varying capabilities for satisfying the training requirements. The technologies included the use of

onboard tape systems, the use of specially built station mock-ups or table top devices with tape input, and the use of acoustic modules for generating signals into the aircraft. The six alternatives are summarized below:

a. Onboard tape system without benefit of instructional materials.

b. Onboard tape system with instructional materials. Use of multi-channel capability to design new tapes from master set.

c. Tape system (compatible with aircraft) with mock-up of operator station and instructor console for real time exercising control.

d. Tape system (compatible with aircraft) with table top trainer having lower procedural fidelity.

e. Acoustic module system with full dynamic, real time control of scenarios.

f. Acoustic module system functionally equivalent to "b" above.

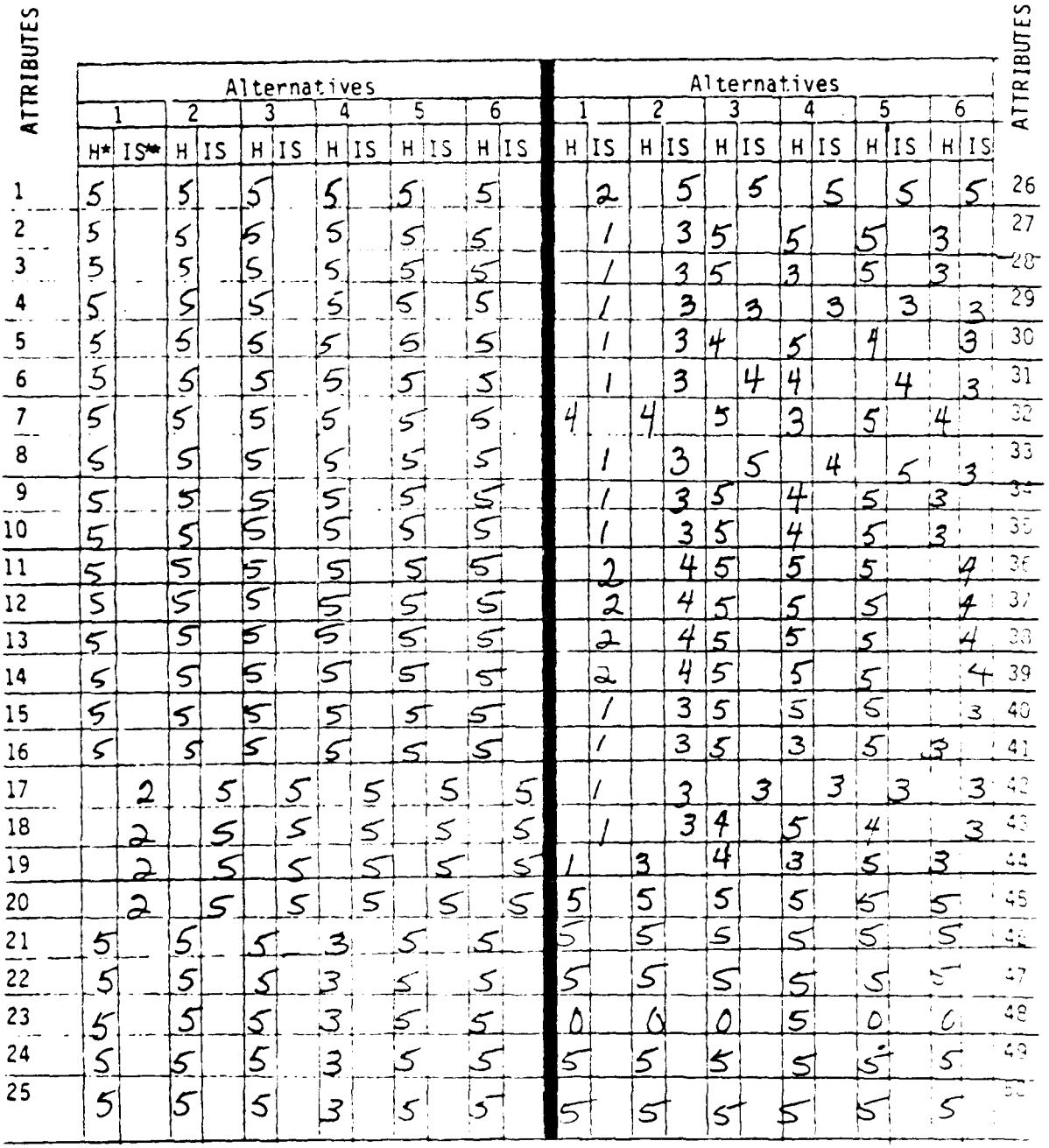
Next, ISD personnel and subject matter experts who knew the capabilities of the onboard tape system and the operator task requirements determined which characteristics required for training were available on the six alternatives and how well each alternative performed on that characteristic. Each configuration was given a score of 0 to 5 for its capability to provide each instructional characteristic. The matrix in Figure 15 summarizes the weights for each instructional characteristic for each media alternative.

INFORMATION ANALYSIS

A selection worksheet was generated by the computer for matching each objective to instructional characteristics. The analysis of objectives was performed by ISD personnel with subject matter expert assistance. Analysts were asked to ensure that the instructional characteristics listing was complete in that: (1) if a characteristic was not on the list and seemed appropriate, it would be added, or (2) if characteristics as they stood did not adequately distinguish the requirement, such a characteristic would be redefined. A few changes did occur. For example, visual and aural data displays were added to the list, while some characteristics were considered to be redundant and eliminated during the course of analysis. Such activities demonstrate the flexibility of AIMS and its capability to maximize the information utilized.

MATCHING AND TRADE-OFFS

Each objective was analyzed within four mission phases: Search, Analysis, Classification, and Localization. Table 6 summarizes the rankings of the six alternatives for each of the four mission phases. Several insights into the media selection process were gleaned from these data. During earlier phases of the project there was a growing concern over whether or not an expensive



ATTRIBUTES	Alternatives 1		2		3		4		5		6		ATTRIBUTES
	H*	IS**	H	IS	H	IS	H	IS	H	IS	H	IS	
1	5		5		5		5		5		5		26
2	5		5		5		5		5		5		27
3	5		5		5		5		5		5		28
4	5		5		5		5		5		5		29
5	5		5		5		5		5		5		30
6	5		5		5		5		5		5		31
7	5		5		5		5		5		5		32
8	5		5		5		5		5		5		33
9	5		5		5		5		5		5		34
10	5		5		5		5		5		5		35
11	5		5		5		5		5		5		36
12	5		5		5		5		5		5		37
13	5		5		5		5		5		5		38
14	5		5		5		5		5		5		39
15	5		5		5		5		5		5		40
16	5		5		5		5		5		5		41
17		2		5		5		5		5		5	42
18		2		5		5		5		5		5	43
19		2		5		5		5		5		5	44
20		2		5		5		5		5		5	45
21	5		5		5		3		5		5		46
22	5		5		5		3		5		5		47
23	5		5		5		3		5		5		48
24	5		5		5		3		5		5		49
25	5		5		5		3		5		5		50

ATTRIBUTES	Alternatives 1		2		3		4		5		6		ATTRIBUTES
	H	IS	H	IS	H	IS	H	IS	H	IS	H	IS	
1		2		5		5		5		5		5	26
2		1		3	5		5		5		3		27
3		1		3	5		3		5		3		28
4		1		3		3		3		3		3	29
5		1		3	4		5		4		3		30
6		1		3		4	4			4		3	31
7	4		4		5		3		5		4		32
8		1		3		5		4		5		3	33
9		1		3	5		4		5		3		34
10		1		3	5		4		5		3		35
11		2		4	5		5		5			4	36
12		2		4	5		5		5			4	37
13		2		4	5		5		5			4	38
14		2		4	5		5		5			4	39
15		1		3	5		5		5			3	40
16		1		3	5		3		5		3		41
17		1		3		3		3		3		3	42
18		1		3	4		5		4			3	43
19	1		3		4		3		5		3		44
20	5		5		5		5		5		5		45
21	5		5		5		5		5		5		46
22	5		5		5		5		5		5		47
23	0		0		0		5		0		0		48
24	5		5		5		5		5		5		49
25	5		5		5		5		5		5		50

* Hardware

** Instructional System

Figure 15. Matrix of instructional attributes/media alternatives weightings for DTS media selection.

acoustic sound generating module("e" in the list above and Alternative 5 in Table 6)would be required for deployed training. This module, as well as the less-expensive, on-board magnetic tape system("b" in the list above and Alternative 2 in Table 6)was included in the media pool. Other questions related to the need for full dynamic control capability and computer-controlled diagnosis, prescription, feedback, and evaluation were also raised. Therefore, several alternatives providing these capabilities were included in the media pool.

Table 6. SUMMARY OF DTS MEDIA SELECTION RANKINGS

Ranking of Six Alternatives by Mission Phase

Selection Ranking	Search	Analysis	Classification	Localization
FIRST	Alternative 5	Alternative 4	Alternative 5	Alternative 5
SECOND	Alternative 3	Alternative 5	Alternative 3	Alternative 3
THIRD	Alternative 4	Alternative 3	Alternative 2	Alternative 2
FOURTH	Alternative 2	Alternative 6	Alternative 6	Alternative 6
FIFTH	Alternative 6	Alternative 2	Alternative 4	Alternative 4
SIXTH	Alternative 1	Alternative 1	Alternative 1	Alternative 1

After the definition of the media pool, it was decided by the sponsoring activity that a field tryout of the tape-based system was needed to determine its effectiveness. The conclusions drawn from the media selection rankings summarized in Table 6 confirm this decision. Although the tape system, with instructional material support did not rank consistently as high across the objectives as the acoustic module, it did satisfy the training requirements, as judged by the media selection personnel, and would be much less expensive. The final determination of the tape system effectiveness, however, should be based on an evaluation in the real training environment since little is known of reliability and other important factors.

SECTION V

CONCLUSIONS AND RECOMMENDATIONS

The design of an automated aid to media selection was based on a common logic found in each of the existing media selection models reviewed and an analysis of functions which are performed by media selection analysts. That common logic is the matching of instructional attributes required by the training to attributes possessed by the available media. The AIMS programs were designed to provide an efficient, flexible computer-based system for media selection. The user has total flexibility in defining a model to address a particular problem.

CONCLUSIONS

Computer-based automated aids for instructional system development should provide the user two advantages: (1) reduce the labor intensive efforts, and (2) allow a more effective development effort to be accomplished. At the beginning of the project, five goals were defined for AIMS which relate to these advantages. They are:

a. Maximize the use of information pertinent to media selection.

b. Provide flexibility in modifying the model to reflect specific problems and changing technology of media or media guidelines.

c. Provide for consideration of student stage of learning.

d. Allow greater, more detailed selection of training devices, such as simulators or other hands-on devices.

e. Allow for variations in the stage of front-end analysis.

These goals were achieved, in part, by designing AIMS to allow the user to define the instructional attributes required of the media and determine the pool of media to be considered. Table 7 summarizes the benefits of AIMS associated with each of the five goals. The AIMS system assists the media selection team in defining a particular model to meet specific needs or in using an existing model.

In addition, as described in Section IV, a large gain is made functionally toward solving the problems associated with media selection in highly unique training situations where it is necessary to determine clearly the required characteristics of a nonexistent training device, and to determine whether an investment in such equipment is justifiable. Such problems are not usually approachable with a generalized, cognitive-learning-based media selection model.

The approach toward these goals through a computerized aid to media selection resulted in what appears to be a significant reduction in the labor intensive aspects of this component of ISD. Experience with the AIMS system

Table 7. BENEFITS OF AIMS

	GOAL	LABOR AND/OR DEVELOPMENT BENEFIT
1.	Maximize Information Used	User may define problem as complex as desired because the automation will considerably reduce the labor time needed for matching and making trade-offs.
2.	Provide Flexibility in Defining Model to Reflect Specific Problems	The user may define a totally new data base of attributes and media which, in effect, becomes a problem-specific media selection model. Changes to the attributes or media pool are easily made.
3.	Consider Stage of Learning	Whatever the user decides is an appropriate categorization of stage of learning can be defined in AIMS as an instructional attribute. Media are then scored and ranked on stage of learning capabilities as well as other specific attributes the user wishes to consider.
4.	Better Selection of Hands-On Training Devices	The user explicitly defines the stage of learning, fidelity and task characteristic variables which differentiate types and amounts of hands-on training needed.
5.	Allow Variations in Stage of Front-End Analysis	The user may define the media pool and attributes in as detailed a level as is appropriate to the information available, from gross to fine. The judgments on which instructional attributes are required may be done with a mission analysis, hardware functional description, task analysis, or learning objectives. AIMS will save time in defining the pools and attributes, and performing trade-off analyses.

has shown that automating even a small media pool (e.g., 20 media by 20 attributes) speeds up the selection process considerably. In a simple test, media selections from the media pool were performed manually for 12 objectives. The overall time for manually matching the attributes for 12 objectives to appropriate media was 41.5 minutes, or 3.45 minutes per objective. The same 12 objectives assessed using the AIMS system required only 9.40 minutes, or 0.78 minutes per objective. If these figures are projected to reflect a major training system with 1000 objectives, the time savings gain is over a man-week. Furthermore, if AIMS were used to vary attributes or media pool items to make trade-offs and run several times, the savings could extend into several man-weeks or even months. It is not uncommon for Navy training systems to have several thousand objectives and the implications for time savings and training quality benefits are clear.

RECOMMENDATIONS

The power of AIMS to allow the user to develop specific media selection models to reflect specific problems, suggested several possible efforts for additional use of AIMS. First, AIMS could be used to build an evaluation tool for new delivery systems. For example, a general set of attributes which reflects a broad set of Navy training objectives could be identified to match against a standard media pool. As a new delivery system is introduced for consideration, its ability to perform on the training attributes could be added to the data base. The new media could then be compared against others on the data base.

A related use of AIMS could be in evaluating media of a particular kind. For example, media pools consisting of only videodisc systems, or all CAI systems, or all slide/sound systems could be developed and rankings determined based on selected learning objective clusters of interest. A logical extension of this concept would be to build a media pool consisting of design alternatives for a particular training capability which needs to be developed. This is an application frequently needed in which AIMS can be a valuable tool.

The above uses of AIMS for delivery system evaluation could provide a tool which does not exist now. The AIMS system would not provide final data for answers to evaluation questions, but it would provide a systematic approach to the process and give support for decisions made. It is recommended that these types of AIMS applications be explored by further study.

A second application area centers on the cost analysis of media. In the current study, the analysis of media training effectiveness was central and that is what AIMS is intended to help with. However, no media selection can be complete without cost analysis. The current TECEP costing technique already provides a cost model which will work for most Navy efforts. It is recommended that the TECEP cost model, or another if appropriate, be interfaced to AIMS so that all decision parameters can be guided by the analyst with computer assistance. Cost data for acquisition and operation of media should be included to provide comparisons for selecting media, but not for providing budget estimates. Budget estimates are appropriate for only a small set of alternatives where a full economic analysis should be performed.

REFERENCES

[illegible], P. A., and Brady, P. Learning Guidelines and Algorithms for [illegible] Training Objectives, TAEG Report No. 23. Orlando, FL: Naval Training Equipment Center, Training Analysis and Evaluation Group, March 1975.

[illegible], R. An Evaluation of Ten Techniques for Choosing Instructional Media, TAEG Report No. 8. Orlando, FL: Naval Training Equipment Center, Training Analysis and Evaluation Group, December 1975.

[illegible] R., Henry, J. M., Parrish, W. F., and Swope, K. M. A Tool [illegible], Cost-Effective Instructional Delivery [illegible], TAEG Report No. [illegible]. Orlando, FL: Navy Training Equipment Center, Training Analysis and Evaluation Group, April 1975.

[illegible], R., Michelli, G. S., Morris, C. L., and Okraski, H. J. Staff Study of Cost and Training Effectiveness of Proposed Training Systems, TAEG Report No. 1. Orlando, FL: Naval Training Equipment Center, Training Analysis and Evaluation Group, 1972.

[illegible]man, E. A. "The Description and Prediction of Perceptual-Motor Skill Training." Training Research and Education. Edited by R. Glaser. Washington, DC: Office of Naval Research, 1961.

[illegible], J. "Front-End Analysis (FEA) for Emerging Weapon Systems." Paper presented at the DoD/DARPA Conference, Santa Fe, NM, September 1974.

[illegible], R. Training Devices and Simulators: Some Research Issues, AFPTRC-WT-54-16. Lackland AFB, TX: Air Force Personnel and Training Research Center, Air Research and Development Command, May 1954.

[illegible], J., O'Neal, F., Kearsley, G., O'Neal, H., Fee, M., Rodi, L., and [illegible]emarris, J. Functional Specifications for Computer Aided Training System Development and Management (CATSDM) Support Functions, NAVTRAEQUIPCEN 77-C-0016-1. San Diego, CA: Courseware, Inc., July 1978.

[illegible], P. G. and Wheaton, G. R. "Training Device Design." In Human Engineering Guide to Equipment Design. Edited by H. P. Van Cott and P. G. Kinkade. Washington, DC: American Institutes for Research, 1972.

[illegible] MAPP III Methods/Media Selection Model. Manassas, VA: IBM Federal Systems Division, 1977.

[illegible], N. C., Blaiwes, A. S. and Bird, P. G. Computer Aided System for Developing Aircrew Training (CASDAT): An Automated Aid for Developing Aircrew Training, NAVTRAEQUIPCEN Technical Report 79-C-0078-1. Arlington, VA: Veda, Inc., March 1981.

[illegible] Specification: Training Requirements for Aviation Weapon Systems, MIL-T-[illegible]. Orlando, FL: Naval Training Equipment Center, October [illegible].

REFERENCES (Cont.)

Miller, G. G. Some Considerations in the Design and Utilization of Simulators for Technical Training, AFHRL-TR-74-65. Air Force Human Resources Laboratory, Lowry Air Force Base, Colorado, August 1974.

Miller, R. G. Psychological Considerations in the Design of Training Equipment, WADC-TR-54-563, AD-71 202, Wright Air Development Center, Wright-Patterson Air Force Base, Ohio, June 1953.

Mirabella, A. and Wheaton, G. R. Effects of Task Index Variations on Transfer of Training Criteria, NAVTRAEQUIPCEN Technical Report 71-C-0126-1. Orlando, FL: Naval Training Equipment Center, January 1974.

Prophet, W. W. U.S. Navy Fleet Aviation Training Development, NAVTRAEQUIPCEN Technical Report 77-C-0009-1. Pensacola, FL: Seville Research Corporation, March 1978.

Tilden, C. H. Problems in Training Equipment Design. Space and Information Systems Division, North American Aviation, Inc., 1962.

APPENDIX

USER'S GUIDE

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APPENDIX
USER'S GUIDE

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SECTION I

INTRODUCTION

Selecting the most effective and efficient media for a training program is a difficult task. For each training objective, there are specific instructional characteristics and requirements which must be met. And for each individual set of instructional requirements, there are usually several media available that meet those requirements. These media, in turn, vary both generally in their ability to deliver instruction and specifically in their ability to meet the exact requirements of a given objective.

In the past, media selection models have tended to group training objectives into broad, general media categories such as "CAI," "workbook" or "simulator." Beyond this level, there were few systematic techniques for further specifying the exact media to employ or to purchase. The media pools from which the models made their selections were rigid and confined. Few models were designed to be adaptable to meet the needs of a variety of training system development programs, and few could be updated to change with emerging weapon systems or changing media technologies. The Automated Instructional Media Selection (AIMS) model was designed to overcome most of the earlier shortcomings. The system provides a general media pool from which to make selections, but this pool is completely editable and updatable. In fact, the user of the system can develop a completely unique media pool, specifically tailored to the needs of a given training program and input the pool into the computer as a data base without the assistance of computer specialists or programming personnel.

The system is designed to allow for an efficient division of labor among personnel. Media specialists can focus on developing media pools, listing up to 99 potential media from which to select, and up to 99 media attributes. Each medium's ability to deliver each attribute can be weighted independently by the media experts to then allow the computer to make final discriminations among the selected media. Educational specialists and subject matter experts can focus on determining the instructional characteristics necessary to meet each training objective. A simple checklist is provided to simplify and facilitate this task. Clerical personnel can enter all data into the computer, and the computer, in turn, assesses, selects, calculates, ranks, prints out, and records the most appropriate media for each objective within a matter of seconds.

This manual is designed to provide general instructions for using the AIMS programs. It is not intended to provide a course in instructional design or media selection. Even if you are quite unfamiliar with computers, stepping through each program on-line with the computer, using this manual as a guide, will provide enough knowledge and practice to allow you to use the system without the need for special programming skills.

Good luck. You can expect to make some mistakes when first familiarizing yourself with the system, but the computer will help by catching some mistakes and sounding a tone when they occur. As you gain

experience with the system and better understand its capabilities, the possibilities and potential grow as far as your imagination will let them, and the work load of the media selection process lessens.

SECTION II

USING THE AIMS SYSTEM

The Automated Instructional Media Selection (AIMS) model is designed to provide rapid access to a data base of up to 99 media and up to 99 instructional characteristics. The basic procedures of the system require that the persons responsible for designing and developing instruction determine the instructional characteristics and media attributes necessary to achieve a given training objective. Once these requirements are determined, the data are entered into the computer. The computer then selects those media which best match the instructional requirements of the training objective. The selected media are ranked in order of appropriateness, and the number of times each medium is selected is tabulated and printed out in a report.

The system contains many instructional passages and menus that appear throughout the program to make it self-explanatory, but a review of this manual is recommended before attempting to do any serious work on the system. Initially, you should step through each phase of the AIMS programs with this manual as a guide. Some of the steps in the procedure are off-line. That is, they take place on paper without the use of the computer. Other steps are on-line, and require direct interaction with the computer. In general, the computer does all of the tasks requiring "rote labor" (such as checking the appropriateness of various media for objectives, calculating rankings, printing and filing information), while a knowledgeable human being is still required for those judgmental tasks requiring experience and expertise (such as determining the necessary instructional characteristics of a given objective).

Although the user does not need to know anything about computer science or computer programming to use the AIMS system, typically a person with some computer experience is required to get the system up and running on a given computer. A programmer's guide with the information necessary to perform that task is available. However, as the user, you can begin learning to use the system by following the six steps below.

These steps describe how to operate the AIMS system using the standard AIMS media pool. However one of the strengths of the AIMS system is that the user can edit any aspect of the media pool at any time to make it more accurately fit the characteristics of the training program or more realistically reflect the readily available media alternatives. The user can even create an entirely new media pool without disturbing the standard AIMS media pool. If you want to update or refine the standard AIMS media pool or create your own media pool, refer to Sections IV, V, and VI of this manual before completing Steps 3 through 6 below.

STEP 1: GETTING THE SYSTEM RUNNING ON THE COMPUTER (ON-LINE)

The first step is to turn on the computer and the printer. Then, typically, you will want to insert the AIMS disk into Drive A (or Drive 1) and, if your system has a second disk drive, you will want to insert a data disk into it. If you are already confused, consult someone who knows something about your particular computer system and how the AIMS system is set up on it. Then, when you are "booted up," you will want to type RUN AIMS followed by a <RETURN>* or 'ENTER'. If that does not work, try typing CRUN2 AIMS followed by a <RETURN> or 'ENTER'. The AIMS menu should appear on the screen.

STEP 2: THE AIMS MENU (ON-LINE)

When the menu appears on the screen, it will read as follows. . .

WELCOME TO AIMS

The Automated Instructional Media Selection (AIMS) model is designed to select media from either a standardized media pool, called AIMS, or from a user-defined media pool. The first step, here, is to type in the name of the media pool you will be using. If you want to use the standard AIMS pool, just type in AIMS followed by a <RETURN>. If you are going to be creating a new media pool, type in an original name (no more than 8 characters, please, and no blank spaces or punctuation marks).

ENTER THE NAME OF THE MEDIA POOL YOU WILL BE USING :

The following steps assume you will be using the standard media pool for the AIMS system. Its name is AIMS, so type in AIMS <RETURN>. If the computer comes back and says . . .

THAT FILE DOES NOT EXIST : DO YOU WISH TO CREATE A NEW MEDIA POOL WITH THE NAME 'AIMS' ? (Y/N)

type in an N <RETURN> and consult your programmer. Otherwise you should see the following message . . .

YOU CAN OPT TO DO ANY OF THE SEVERAL FUNCTIONS BELOW AT THIS POINT.
EACH OF THESE FUNCTIONS IS DESCRIBED IN DETAIL IN THE USER'S MANUAL.

SELECT THE FUNCTION YOU WISH TO PERFORM FROM THE CHOICES BELOW:

1. SELECT MEDIA
2. CREATE A MEDIA POOL DATA BASE
3. EDIT A MEDIA POOL
4. PRINT MEDIA POOL/SELECTION INFORMATION
5. RETURN TO OPERATING SYSTEM

* The symbol <RETURN> refers to depressing the carriage return key (called the 'ENTER' key on some computers). All user inputs are generally followed by a <RETURN>.

If you wish to create a unique media pool or change the standard AIMS media pool, you should select function 2 or 3 from the AIMS menu before going on to Step 3.

STEP 3: PRINTING MEDIA POOL INFORMATION (ON-LINE)

Before you actually select media (function 1 from the AIMS menu), you will need information about the AIMS media pool. This is a simple process.

Select function 4 PRINT MEDIA POOL/SELECTION INFORMATION from the START menu by typing in a 4 <RETURN>. The PRINT menu will then appear on the screen. Refer to Section III of this manual for detailed descriptions and examples of the print functions.

STEP 4: MATCHING OBJECTIVES TO INSTRUCTIONAL ATTRIBUTES (OFF-LINE)

The next step in the media selection procedure takes place without the aid of the computer. This is one of those human, judgmental tasks that the computer cannot perform. The procedure is as follows. First, you need to obtain a list of the objectives (or task statements) for which you are interested in selecting media. Next, you need to make at least one selection worksheet for each objective on that list either by printing the worksheet repeatedly with the computer or by photocopying the original. Then, stepping through one objective at a time, fill in the objective number on a worksheet. You can jot down the objective in the space provided on the worksheet, if you so desire. Finally, check off the boxes on the worksheet that represent the instructional characteristics required to meet the objective under consideration.

Figure A-1 shows a completed worksheet for hypothetical objective number 1.1.2., STATE INSPECTION POINTS OF LIFE VEST. As shown, the person determining the necessary instructional attributes for this objective felt it should be classified as (1) Cognitive learning type with display characteristics of (4) Verbal/Text and (6) Drawings as sufficient instructional attributes. Hence, the appropriate boxes are checked off on the worksheet.

As another example, the objective PERFORM EMERGENCY PROCEDURES FOR NAVIGATION EQUIPMENT FAILURE would probably be classified as Psychomotor learning type and require more extensive instructional characteristics, such as Kinesthetic Cues, Immediate Feedback, Manipulative Response and Crew/Team Interaction. If this were the case, then the appropriate boxes would be checked off on the worksheet for that objective and the computer would make selections accordingly.

In general, it is best to perform this step for a group of objectives before going back on-line with the computer. There will often be disagreements among raters as to what are essential characteristics, but this is a human, judgmental task that the computer cannot aid in. Once a number of worksheets have been completed, you can go back on-line to begin the next step.

SELECTION WORKSHEET FOR USE WITH THE FILE : AIMS

Objective Number: 1.1.2

Objective: STATE INSPECTION POINTS OF LIFE VEST

Put a check in the boxes next to the attributes required of any medium which might be used to meet this objective.

* I. TYPE OF LEARNING
- ☑ 1. Cognitive
- ☐ 2. Psychomotor
- ☐ 3. Affective (attitudinal)

* II. DISPLAY CHARACTERISTICS
- ☑ 4. Verbal/Text
- ☐ 5. Photographs
- ☑ 6. Drawings
- ☐ 7. Diagrams
- ☐ 8. Colors
- ☐ 9. Visual Motion (constant)
- ☐ 10. Visual Motion (variable
- ☐ 11. 3-Dimensional
- ☐ 12. Audio (voice)
- ☐ 13. Audio (ambient)
- ☐ 14. Tactile Cues
- ☐ 15. Kinesthetic Cues

* III. RESPONSE MODE
- ☐ 16. Verbal/written response
- ☐ 17. Voice response
- ☐ 18. Decision Indicator
- ☐ 19. Fine Motor Response
- ☐ 20. Gross Motor Response
- ☐ 21. Tracking Response
- ☐ 22. Manipulative Response
- ☐ 23. Continuous Response

* IV. EVALUATION MODE
- ☐ 24. Instructor Evaluation
- ☐ 25. Self Evaluation
- ☐ 26. Peer Evaluation
- ☐ 27. Automated Evaluation
- ☐ 28. Verbal/Written Eval.
- ☐ 29. Immediate on Response
- ☐ 30. Immediate on Error
- ☐ 31. Post-Session Evaluation

* V. ENVIRONMENTAL CONDITIONS
- ☐ 32. Physical Motion
- ☐ 33. Acceleration
- ☐ 34. Pitch/Roll
- ☐ 35. Vibration
- ☐ 36. Restrictive Clothing

* VI. LEARNING LEVELS
- ☐ 37. a. Familiarity
- ☐ 38. b. Perform Procedure
- ☐ 39. c. Perform Job
- ☐ 40. d. Perform Mission

* VII. SPECIAL REQUIREMENTS
- ☐ 41. Crew/Team Interaction
- ☐ 42. Large Memorization Comp
- ☐ 43. Random Access Logic

Figure A-1. Example of completed media selection worksheet using the standard AIMS media pool.

STEP 5: SELECTING MEDIA (ON-LINE)

If you disconnect yourself from the computer to perform the previous step, you will have to get the AIMS system up and running on the computer again. Then you will need to key in the appropriate file name (AIMS) and select function 1, SELECT MEDIA, from the START menu. If you are still on-line, just type in a 1 <RETURN>. You will get the following message on the CRT . . .

TO USE THE MEDIA POOL, AIMS, MAKE SURE THAT THIS FILENAME APPEARS AT THE TOP OF THE WORKSHEET THAT YOU WILL BE KEYING IN THE DATA FROM. THEN TYPE IN EACH OF THE NUMBERS THAT HAVE BEEN CHECKED OFF ON THE WORKSHEET, BEING SURE TO FOLLOW EACH NUMBER WITH A <RETURN>.
FOR EXAMPLE, IF BOXES 1, 3, 9, AND 14 ARE CHECKED OFF ON THE WORKSHEET, YOU WANT TO TYPE IN:

1 <RETURN>
3 <RETURN>
9 <RETURN>
14 <RETURN>
0 <RETURN>

WHEN YOU ARE DONE, TYPE IN A '0' AS THE LAST NUMBER.
IF YOU NEED MORE INFORMATION, REFER TO THE USER'S MANUAL.

STRIKE ANY KEY (FOLLOWED BY <RETURN>)WHEN READY TO CONTINUE :

Going back to the first example, you want the computer to select media with attributes (1) Cognitive learning type, (4) Verbal/Text and (6) Drawings for objective 1.1.2. First, strike a key and hit <RETURN>. You will get the following message. . .

DO YOU WANT TO PRINT OUT SELECTION MEDIA ON PAPER (Y/N) ? :

If you are hooked up to a printer, type in a Y <RETURN>, otherwise type in a N <RETURN>. Then the message . . .

WHAT OBJECTIVE NUMBER DO YOU WANT TO ACCESS ? :

appears on the screen. At this point, simply key the objective number from the worksheet into the computer, followed by a <RETURN>. (In the present example, you would type in 1.1.2 <RETURN>.) The next message to appear on the screen is . . .

ENTER AN ATTRIBUTE NUMBER (or 0 if done) :

Referring to the worksheet for the example (Figure A-1), you see that 1 is the first box checked off, so you would key in a 1 <RETURN>. The very same message appears on the screen again. The screen looks like this now . . .

```
ENTER AN ATTRIBUTE NUMBER (or 0 if done) : 1
ENTER AN ATTRIBUTE NUMBER (or 0 if done) :
```

The computer is expecting another attribute number. The next one checked off on the worksheet for the example is a 4. If you key this number in, you get the same message again. Only this time the screen looks like this . . .

```
ENTER AN ATTRIBUTE NUMBER (or 0 if done) : 1
ENTER AN ATTRIBUTE NUMBER (or 0 if done) : 4
ENTER AN ATTRIBUTE NUMBER (or 0 if done) :
```

The next attribute number in the example is 6, so you would key in a 6 <RETURN>. Since you do not have any more attributes to key in, you would type in a 0 <RETURN>. At this point, the computer begins its work. It looks at each medium in the media pool and selects those media which have the attributes you have entered. Next, it looks at how those media have been rated in relation to the selected attributes and decides which is the best medium for these attributes, the second best medium, third best medium, etc. Then, it prints out the results on either the CRT or the printer (depending on how you responded to the previous hardcopy question).

Figure A-2 is an example of the printout provided by the computer describing its selection of media for objective number 1.1.2. As shown, the media are printed out in rank-order fashion based on the numbers in the specific rating column. This specific rating is the computer's calculation of how well the selected medium meets the specific instructional characteristics of this objective. Note that several media were selected, with Workbook as the primary choice. Generally you will not be too concerned about the media selected for a single objective, since it is media information about groups of objectives that is important in the selection process. The AIMS system provides information about media selections for groups of objectives in Step 6. For now, you need to keep keying in data about the instructional characteristics of the objectives. To do so, answer the computer's next question . . .

```
ARE YOU READY FOR THE NEXT OBJECTIVE (Y/N) :
```

by keying in a Y <RETURN>. The computer will repeat the process just described by first requesting the objective number, then the specific instructional characteristics of that objective. Repeat this process until all of the objectives for a given group have been "mediated." Then, when the computer asks if you are ready for the next objective type in an N <RETURN> and the computer will print out a summary of the media selections made for a given group of objectives.

Figure A-3 presents an example of a final tabulation summary. The media are presented in order of most- to-least selected, with non-selected media not listed. The report indicates 55 objectives were input in this group. The next two columns describe how many times each medium was selected and the percent of objectives which were satisfied by this medium, respectively.

MEDIA SELECTION FOR OBJECTIVE 1.1.2

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	Workbook	3.750	3.5
2.	Random Access Slides	3.250	3.15
3.	Lecture	3.250	3.217
4.	Motion Picture	2.750	2.947
5.	Videodisc	2.500	3.142
6.	Syncro-Pulse (Cue-See)	2.500	2.952
7.	Slides	2.500	2.937
8.	Video Tape	2.250	3.012

Figure A-2. Example of media selection printout using the standard AIMS media pool.

MEDIA SELECTION: FINAL TABULATION FOR 55 OBJECTIVES:

	# OF OBJECTIVES	% OF OBJECTIVES	MEDIUM
1.	44	0.800	OP. Equip./OP.Environment
2.	37	0.673	Team Trainer
3.	33	0.600	Part Task Trainer
4.	25	0.455	Demonstration
5.	22	0.400	GETS
6.	22	0.400	CAI
7.	20	0.364	PLATO + Videodisc
8.	19	0.345	Slides/Audio
9.	19	0.345	Motion Picture/Videotape
10.	17	0.309	Besseler Cue-See
11.	17	0.309	TICCIT + Videodisc
12.	15	0.273	Lecture
13.	12	0.218	3-D Mock-up
14.	12	0.218	OP. Equip./Lab
15.	12	0.218	Teaching Machine
16.	11	0.200	Slides
17.	11	0.200	Audio Tape
18.	10	0.182	Procedural Trainer
19.	10	0.182	Random Access Slides
20.	9	0.164	Workbook
21.	8	0.145	Group Discussion
22.	5	0.091	2-D Mock-up

Figure A-3. Example of final tabulation summary for media selected for a group of objectives.

The name of the medium is presented in the last column. So in the example in Figure A-3, the medium OP. Equipment was selected 44 times (out of 55 possible). It satisfied 80 percent of the 55 objectives. Medium number 22 on the list, 2-D Mock-up, was selected only five times, satisfying only 9 percent of the objectives.

The final tabulation summary is valuable in providing an overview of the media most applicable to a given set of objectives. This is particularly important during very early stages of training systems development when a general overview of eventual media needs is all that can be expected. The rank order of the media also gives some idea of the criticality of each medium for that set of objectives.

However, as described in Step 6 below, more information is available about the computer's selection of media than the summary provides. The computer also keeps a record of each objective number and the five highest-ranked media selected for each objective, as well as the specific rating assigned each medium. Depending on how your programmer sets up the system, you will probably have different data bases of objectives with their selected media on separate disks.

STEP 6: PRINTING SELECTION DATA (ON-LINE)

When all of the objectives in a given group have been through the selection process, you will probably want information about the media characteristics and media combinations. The AIMS system provides this through function 4, PRINT MEDIA POOL/SELECTION INFORMATION, on the START menu. When you select this function, you will get the PRINT menu. When you select function 5, PRINT SELECTION DATA, from the PRINT menu you get the following series of events.

First, the computer informs you that . . .

```
THIS PROGRAM ALLOWS YOU TO SEARCH OUT OBJECTIVES WITH
A GIVEN MEDIUM OR MEDIA COMBINATION
```

then asks . . .

```
DO YOU WISH TO LIST OUT THOSE OBJECTIVES FOR
WHICH NO MEDIA WERE SELECTED (Y/N) :
```

If you type in a Y <RETURN> in response to the question, the computer will ask . . .

```
DO YOU WANT A HARD COPY OF THE DATA (Y/N):
```

If you type in a Y <RETURN>, the computer will print on paper those objective numbers for which no media were selected. Otherwise it will list those objective numbers on the screen. The computer then displays a new message . .

```
THIS PROGRAM ALLOWS YOU TO KEY IN UP TO 5 MEDIA, AND THEN
SEARCHES THE DATA FILE FOR OBJECTIVES WHICH HAVE THOSE MEDIA.
YOU CAN ENTER ANY COMBINATION OF MEDIA THAT YOU WISH.
```

Then the computer asks . . .

```
ENTER THE FIRST MEDIUM NUMBER (0 if done) :
```

At this point, you need to have a list of media on the data base. Then you can search for any medium or combination of media among the objectives by typing in the media you are interested in. For example, if you want to pull out all of the objectives for which both Medium 1 and Medium 2 were selected, you would type in a 1 <RETURN>. Then the CRT would look like this . . .

```
ENTER THE FIRST  MEDIUM NUMBER (0 if done) : 1
ENTER THE SECOND MEDIUM NUMBER (0 if done) :
```

Then you would type in a 2 <RETURN> and the screen would look like this . . .

```
ENTER THE FIRST  MEDIUM NUMBER (0 if done) : 1
ENTER THE SECOND MEDIUM NUMBER (0 if done) : 2
ENTER THE THIRD  MEDIUM NUMBER (0 if done) :
```

Since you are only interested in Medium 1 and Medium 2, type in a 0 <RETURN>. The computer then double checks for accuracy by printing on the CRT. . .

```
1. FIRST MEDIUM : 1. WORKBOOK
2. SECOND MEDIUM: 2. LECTURE

IS THIS OK ? (Y/N):
```

Since this is what you wanted, type in a Y <RETURN>. Then the computer goes to work finding all of the objectives for which these two media were selected. Figure A-4 is an example of a report generated by this program. Note that up to five media are listed for each objective. These are the five highest-ranked media selected for that objective during the selection procedure. The specific rating for each medium is also included.

This function is valuable for grouping objectives into media categories, which often helps in determining how to organize lessons. With experience, the function of searching the objectives for certain media or combinations of media becomes the most powerful aspect of the AIMS system. Using this function, it is possible to try out a variety of media combinations without a great deal of effort to see how the objectives and selected media relate.

OBJECTIVES WITH THE FOLLOWING MEDIA ON THE FILE : 'AIMS'

1. FIRST MEDIUM : 1 Workbook
2. SECOND MEDIUM : 2 Lecture

Objective Number 1.2.4.3

1. Workbook	4.75	2. Syncro-Pulse (Cue-See)	4.00
3. Videodisc	3.37	4. Random Access Slides	3.87
5. Lecture	3.87		

Objective Number 2.1.1.1.2

1. Workbook	3.75	2. Random Access Slides	3.25
3. Lecture	3.25	4. Motion Picture	2.75
5. Videodisc	2.50		

Figure A-4. Example of printout for selected media by objective numbers.

SECTION III

USING THE PRINT FUNCTIONS

The print functions of AIMS are valuable for obtaining written records of the contents of various files. Generally, whenever a new data base is created, you will want to use the print functions to check your accuracy in keying in the data. To access the print functions, you need to select option 4, PRINT MEDIA POOL/SELECTION INFORMATION, from the START menu. The first CRT request will be. . .

WHAT MEDIA POOL DO YOU WANT TO ACCESS?

Enter the name of the media pool you wish to access. This will be the media pool you will be accessing as long as you are in the print function, regardless of how many different programs you use. To change media pools, you have to return to the START menu and re-access the print functions.

Once you have entered a valid file name, the CRT displays. . .

PRINT MENU

PRINT OPTIONS FOR (your file name)

1. LIST MEDIA
2. LIST ATTRIBUTES
3. LIST MEDIA/ATTRIBUTES TABLE
4. CREATE SELECTION WORKSHEET
5. PRINT SELECTION DATA
6. RETURN TO START

ENTER YOUR SELECTION <RETURN>:

Each time you select a given print function, the computer will ask. . .

DO YOU WANT A PAPER COPY OF THE OUTPUT (Y OR N)?

If you have a printer that is ready to print, type in a Y <RETURN> to produce a hardcopy of the output. Otherwise, type in an N <RETURN> and it will just be listed on the CRT. The first five functions are described below. When you type in a 6 <RETURN>, you will go out of the print functions back to the START menu.

FUNCTION 1: LIST MEDIA

When you select function 1 and request a paper copy of the output, a listing of all the media on the requested media pool will be produced on the printer. Figure A-5 shows a listing of the AIMS media pool. The name of the media pool is included on the listing, so if something seems amiss on your output make sure you have requested the correct media pool. If not, return to the START menu and request the print functions by typing in a 4 <RETURN>.

MEDIA LISTED ON THE FILE : AIMS

1	Workbook
2	Lecture
3	Slides
4	Slide/Tape
5	Audio Tape
6	Random Access Slides
7	Motion Picture
8	Video Tape
9	Syncro-Pulse (Cue-See)
10	Videodisc
11	Teaching Machine
12	2-D Mock-up
13	3-D Mock-up
14	Procedural Trainer
15	Part Task Trainer
16	Team Trainer
17	Weapon Systems Trainer
18	High Fidelity Simulator
19	Realia (Actual Equipment)
20	CAI: TICCIT
21	CAI: PLATO
22	CMI/Workbook

Figure A-5. Printout of the media listed on the file AIMS.

FUNCTION 2: LIST ATTRIBUTES

Figure A-6 shows an attributes listing from the AIMS media pool. The procedure for producing the attributes list is identical to the method for listing media. However, on the attributes listing, the headings preceded by an asterisk are in Roman numeral order. This was accomplished when the data base was originally put on-line. Type in an "*" when typing in your heading, followed by the appropriate Roman numeral, then the attribute heading. The headings will be stored exactly as you type them in.

FUNCTION 3: LIST MEDIA/ATTRIBUTES TABLE

Figure A-7 provides the media by attributes table for the AIMS media pool. This printout is a little more complex than the others. It displays:

a. The file (media pool) name

b. All media names (in rows)

c. Attribute numbers (across top column)

d. All ratings between media and attributes (individual cells)

The attribute numbers which appear across the top row are taken from the attributes listing. Only the numbers are presented since it is impossible to print out attribute names to fit into vertical columns. The relationship between the media and the attributes are rated on a scale of 0 (no relationship) to 5 (strong relationship).

FUNCTION 4: CREATE SELECTION WORKSHEET

The selection worksheets are produced by the computer to allow training systems designers and developers to determine the instructional characteristics necessary to deliver instruction for each objective. This function was described in detail in Section II, Step 4.

FUNCTION 5: PRINT SELECTION DATA

The selection data for a given group of objectives is analyzed and then summarized by the computer to determine the best medium or media combinations. This function was described in detail in Section II, Step 6.

ATTRIBUTES [illegible] : AIMS

*I. TYPE OF [illegible]
1. Cognitive
2. Psychomotor
3. Affective (Attitudinal)
*II. DISPLAY CHARACTERISTICS
4. Verbal/Text
5. Photographs
6. Drawings
7. Diagrams
8. Colors
9. Visual Motion (Constant)
10. Visual Motion (Variable)
11. 3-Dimensional
12. Audio (voice)
13. Audio (alarms)
14. Tactile Cues
15. Kinesthetic Cues
*III. RESPONSE MODE
16. Verbal/Written Response
17. Voice response
18. Decision Indication
19. Fine Motor Response
20. Gross Motor Response
21. Tracking Response
22. Manipulation Response
23. Continuous Response
*IV. EVALUATION MODE
24. Instructor Evaluation
25. Self Evaluation
26. Peer Evaluation
27. Automated Evaluation
28. Verbal/Written Test
29. Immediate Response
30. Immediate Feedback
31. Post-Session Evaluation.
*V. ENVIRONMENTAL CONDITIONS
32. Physical Motion
33. Acceleration
34. Pitch/Roll
35. Vibration
36. Restricted Seating
*VI. LEARNING
37. a. Familiarization
38. b. Performance Measure
39. c. Performance
40. d. Performance
*VII. SPECIAL REQUIREMENTS
41. Crew/Team Coordination
42. Large Visual Component
43. Random Access

Figure A-6. Printout of attributes in the pool AIMS.

This report lists the media on file AIMS, and provides a list of numbers corresponding to the attributes on this file. The attributes assigned to a given medium on the data base can be determined by cross-referencing this list of numbers with a numbered listing of the attributes themselves.

ATTRIBUTE NUMBER ---->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
MEDIA																				
1. Workbook	2	0	1	5	3	5	5	4	0	0	0	0	0	0	0	5	0	0	0	0
2. Lecture	5	0	5	1	4	4	4	4	1	1	2	5	1	0	0	3	5	0	0	0
3. Slides	5	0	4	2	5	4	4	5	0	0	0	0	0	0	0	1	1	0	0	0
4. Slide/Tape	5	0	4	1	5	4	4	5	0	0	0	5	4	0	0	0	1	0	0	0
5. Audio Tape	5	0	2	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	0	0
6. Random Access Slides	5	0	2	5	5	4	4	5	0	0	0	4	4	0	0	1	1	4	0	0
7. Motion Picture	5	0	5	4	4	3	1	5	5	0	0	5	3	0	0	1	1	0	0	0
8. Video Tape	5	0	5	1	5	4	4	5	5	2	0	5	3	0	0	1	1	0	0	0
9. Syncro-Pulse (Cue-See)	5	0	1	4	4	4	4	4	4	4	0	0	0	0	0	1	1	0	0	0
10. Videodisc	5	0	5	4	4	4	4	5	5	5	0	5	3	0	0	1	1	0	0	0
11. Teaching Machine	5	0	0	5	0	0	0	1	0	0	0	0	0	0	0	1	0	5	0	0
12. 2-D Mock-up	2	4	0	0	0	0	0	5	0	0	0	0	2	1	5	0	0	1	5	5
13. 3-D Mock-up	0	5	0	0	0	1	1	5	0	0	5	0	0	0	5	0	4	1	5	5
14. Procedural Trainer	0	5	0	0	4	0	2	5	2	2	5	5	3	3	5	0	5	1	5	5
15. Part Task Trainer	0	5	0	0	0	0	2	5	3	3	5	4	4	5	5	0	4	1	5	5
16. Team Trainer	0	5	0	0	0	1	1	5	5	5	5	4	4	5	5	0	5	1	5	5
17. Weapon Systems Trainer	0	5	0	0	0	0	0	5	5	5	5	4	4	5	5	0	5	1	5	5
18. High Fidelity Simulator	0	5	0	0	0	0	0	5	5	5	5	5	5	5	5	0	5	1	5	5
19. Realia (Actual Equipment	0	5	0	0	0	0	0	5	5	5	5	5	5	5	5	0	5	1	5	5
20. CAI: TICCIT	5	0	5	4	1	0	1	1	4	3	3	1	1	0	0	1	0	5	0	0
21. CAI: PLATO	5	0	5	4	1	0	1	1	4	3	3	1	1	0	0	1	0	5	0	0
22. CMI/Workbook	5	0	1	2	1	1	1	1	0	0	0	0	0	0	0	5	0	5	0	0

Figure A-7. Printout of the media x attributes table for the file AIMS.

MEDIA X ATTRIBUTES TABLE ** CONTINUED **

ATTRIBUTE NUMBER ---->	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
MEDIA																							
1. Workbook	0	0	0	5	5	2	0	5	2	1	1	0	0	0	0	0	5	0	0	0	0	3	1
2. Lecture	0	0	0	5	5	5	0	4	2	1	1	0	0	0	0	0	5	0	0	0	0	1	0
3. Slides	0	0	0	2	2	2	0	1	0	0	3	0	0	0	0	0	5	0	0	0	0	1	0
4. Slide/Tape	0	0	0	2	2	2	0	1	0	0	3	0	0	0	0	0	5	0	0	0	0	1	0
5. Audio Tape	0	0	0	2	2	2	0	1	0	0	1	0	0	0	0	0	5	0	0	0	0	1	0
6. Random Access Slides	0	0	0	2	2	2	0	1	0	0	1	0	0	0	0	0	5	0	0	0	0	1	0
7. Motion Picture	0	0	0	2	2	2	0	1	0	0	1	0	0	0	0	0	5	0	0	0	0	1	0
8. Video Tape	0	0	0	2	2	2	0	1	0	0	1	0	0	0	0	0	5	0	0	0	0	1	0
9. Syncro-Pulse (Cue-See)	0	0	0	2	5	1	0	1	1	1	1	0	0	0	0	0	5	0	0	0	0	4	5
10. Videodisc	1	1	1	2	4	1	4	1	3	3	1	0	0	0	0	0	5	1	0	0	0	4	5
11. Teaching Machine	0	0	0	1	4	1	5	5	5	5	1	0	0	0	0	0	5	0	0	0	0	4	1
12. 2-D Mock-up	1	2	1	4	4	1	0	1	1	1	1	0	0	0	0	0	5	2	0	0	0	0	0
13. 3-D Mock-up	1	3	2	4	4	1	0	1	1	1	1	0	0	0	0	0	5	5	0	0	0	0	0
14. Procedural Trainer	5	3	4	4	5	3	1	1	2	2	1	0	0	0	0	0	4	5	0	0	0	0	0
15. Part Task Trainer	4	3	3	4	5	3	1	1	2	2	1	0	0	0	1	0	0	0	0	0	0	0	0
16. Team Trainer	1	1	1	4	5	5	1	1	3	3	4	0	0	0	0	1	0	5	3	1	5	0	0
17. Weapon Systems Trainer	5	5	5	5	5	3	4	1	5	5	4	0	0	0	0	1	1	5	5	0	5	0	0
18. High Fidelity Simulator	5	5	5	4	5	5	4	1	5	5	4	3	2	2	2	4	0	0	5	2	5	0	0
19. Realia (Actual Equipment	5	5	5	5	4	4	0	0	5	5	5	5	5	5	5	5	0	0	5	5	5	0	0
20. CAI: TICCIT	5	1	1	0	4	0	5	2	5	5	1	0	0	0	0	0	5	0	0	0	0	5	5
21. CAI: PLATO	5	1	1	0	4	0	5	2	5	5	1	0	0	0	0	0	5	0	0	0	0	5	5
22. CMI/Workbook	0	0	0	5	2	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	1	0

Figure A-7. Continued.

SECTION IV

EDITING THE MEDIA POOL

It is unlikely that a standard media pool will be satisfactory for many selection problems. It is also unlikely that a satisfactory media pool will stay satisfactory indefinitely. Therefore, the AIMS system provides the user with several editing functions which can be used to update or change the media pool data base on-line. These editing functions include: (a) adding a medium to the media pool, (b) adding an attribute to the media pool, (c)changing a single rating between a given medium and a given attribute, and (d) changing a given medium or attribute and all of the ratings that go with it.

Section VI provides a theoretical discussion of how media selections for individual objectives can be used to refine the selection process. The mechanics of editing the media pool for purposes of refinement are described here. During this process, the computer provides instructions to the user and any error that you may make (other than spelling of a medium or attribute) will be caught by the computer and you will be able to correct the error quite easily.

The START menu allows you to select function 3, EDIT A MEDIA POOL. When you type in a 3 <RETURN>, the following menu appears on the screen. . .

EDIT MENU

WHICH FUNCTION DO YOU WISH TO PERFORM ?

1. ADD A MEDIUM
2. ADD AN ATTRIBUTE
3. CHANGE A RATING
4. CHANGE A MEDIUM
5. CHANGE AN ATTRIBUTE
6. RETURN TO AIMS MENU

The first five functions are described below. When you type in a 6 <RETURN>, you will go out of the EDIT menu back to the START menu.

FUNCTION 1: ADD A MEDIUM

Changes in budgets, training programs, and technology bring about the need for most training systems designers to consider an ever-expanding range of media. New media can be added to the media pool quite easily by selecting function 1 on the EDIT menu. However, remember that every new medium you add will have to be cross-referenced with all of the attributes on the media pool. It is best to take care of this procedure on paper before working on-line. (You can review this procedure in Section V of the manual under the heading "Cross-reference media and their attributes.")

When you type in a 1 <RETURN>, the computer displays . . .

WHAT IS THE NAME OF THE MEDIUM TO BE ADDED?

Then type in the name of the medium to be added, followed by a <RETURN>. Next you will be asked to relate that medium to the attributes in the media pool using the scale of 0 (no relationship) to 5 (strong relationship) discussed in Section V. The computer will automatically advance you through the attributes and inform you when it is done. At this point, you will return to the START menu by typing in a 6 <RETURN>.

FUNCTION 2: ADD AN ATTRIBUTE

This function allows you to add new attributes to the media pool data base. The ability to add attributes is very valuable in refining the selection process, as discussed in Section VI of this manual. Like function 1, any new attributes that you add will have to be cross-referenced with all the media in the pool. This procedure is best performed off-line before using the computer. (You can review this procedure in Section V of the manual under the heading "Cross-reference media and their attributes.")

When you type in a 2 <RETURN> the computer displays . . .

THIS WILL BE AN ATTRIBUTE (X) ON THE FILE (AIMS)
BEFORE USING THIS PROGRAM, MAKE SURE YOU
HAVE ALL OF YOUR RATINGS WORKED OUT ON PAPER FIRST

TYPE IN THE NEW ATTRIBUTE FOLLOWED BY A <RETURN>

The computer then requests that you rate each medium with the new attribute using the 0-to-5 scale. Upon completion, you will return to the START menu by typing in a 6 <RETURN>.

FUNCTION 3: CHANGE A RATING

This function allows you to change the rating between any given medium and any given attribute. The procedure is simple. When you type in a 3 <RETURN> from the EDIT menu, the computer will ask what medium (by number) you want to change a rating on. Type in the number <RETURN> and it will ask you what attribute (by number) you want to make the change on. Type in the attribute number <RETURN> and then type in the new rating by number (0-5) <RETURN>.

FUNCTION 4: CHANGE A MEDIUM

When you select function 4 from the EDIT menu, the computer displays . .

WHICH MEDIUM (by number) DO YOU WISH TO CHANGE?:

Type in the number of the medium you wish to change <RETURN>. If that medium number does not exist, the computer will tell you so and ask you to re-enter the medium number. Otherwise the computer will display the medium requested and ask you to key in the new medium <RETURN>. The computer then asks you if you wish to key in new ratings between the new medium and the present attributes on the data base. If you type in an N <RETURN>, the computer will return to the EDIT menu. Otherwise it will step through each attribute and request that you rate the relationship between the medium and attribute again. As discussed earlier, this procedure is best accomplished on paper before working on-line.

FUNCTION 5: CHANGE AN ATTRIBUTE

Like function 4, when you select function 5 the computer will ask you to type in the attribute number to be changed <RETURN>. Then the computer will ask if you wish to change all of the ratings between the new attribute and each medium on the data base. If you merely changed the spelling or wording of the original attribute, then this should not be necessary. If you have replaced the old attribute with an entirely new attribute, you may want to change all of the ratings. To do so, type in a Y <RETURN> and the computer will step through each medium. Determining the rating for each medium/attribute pair should be performed off-line, as discussed earlier.

You will notice that there is no user-oriented capability for eliminating (or deleting) an attribute from the media pool data base. The system was purposely designed without this function as a safeguard to ensure that no major disasters occurred in the selection process. If it were possible for a user to delete an attribute, the following problem could occur. If a given user decided to eliminate, for instance, attribute 10, attribute 12 would become attribute 11, and so forth. Another user, unaware of the change, might key in instructional attributes from worksheets based on the old numbering system. The resulting media selections would then be totally false without the present user necessarily knowing why. So, as a safeguard, users can add or change attributes, but all of the original attributes will retain their original numbers. Considering that the AIMS system allows up to 99 attributes and many of the attributes may be changed by the user, the lack of a capability to delete attributes seems a reasonable safeguard.

SECTION V

CREATING A UNIQUE MEDIA POOL

One of the basic assumptions of the AIMS system is that there is no universal media pool suitable for the requirements of all instructional situations. Media pools will necessarily vary in both the media and the instructional characteristics they contain, the level of specificity they require, and many other qualities. Because of this, the AIMS system allows the user to develop project-specific media pools. The media pool can be edited or added to without the need for a programmer to make the changes. The user can update media pools, select selection procedures, and experiment with various media pools with a minimum of effort.

STEP 1: DEVELOPING A MEDIA POOL (OFFLINE)

It is often difficult to know where to begin when developing a unique media pool. The following steps have been identified to provide some structure for the process:

1. Determine the media to be considered

The first task is to figure out what media might be relevant to a given training project. Make a list of all of the media, or combinations of media, to be included in the pool. It is advisable to allow for a wide range of alternatives since the pool can be narrowed if a shorter version is desired for a given project. Figure A-8 is a sample listing of a new media pool labeled POOL. It is a broad list including both cognitive and hands-on type media. Once you have determined the media relevant to your training objectives, you can begin the next task.

2. Determine the instructional characteristics

Defining the instructional characteristics or attributes can be a difficult task. Figure A-9 presents a sample list of attributes from the media pool POOL. Note that the attributes are clustered into groups of similar characteristics: (1) Display Characteristics, (2) Response Mode, (3) Evaluation Mode, (4) Feedback, and (5) Special Requirements. Breaking the attributes into small categories like this simplifies the task of creating the media pool and helps make the list itself a bit more legible.

Using this sample as a guide, make a list of the attributes that each medium on your list has. Think in terms of the following categories:

a. What are the display characteristics: Does it have printed text, diagrams, color? Does it show visual motion? Is it 2-dimensional or 3-dimensional? Does it move itself? What are the stimulus characteristics of the medium?

MEDIA LISTED ON THE FILE : pool

1. CAI
2. Random Access Slides
3. Motion Picture/ Videotape
4. Slides/Audio
5. Audio/Tape
6. Slides
7. Lecture
8. Demonstration
9. Group Discussion
10. Workbook
11. Teaching Machine
12. OP. Equip./OP. Environment
13. OP. Equip./Lab
14. Team Trainer
15. Procedural Trainer
16. Part Task Trainer
17. 3-D Mock-up
18. 2-D Mock-up
19. TICCIT + Videodisc
20. PLATO + Videodisc
21. GETS
22. Besseler Cue-See

Figure A-6. Sample listing of media on the new file POOL.

ATTRIBUT [illegible] IF : pool

[illegible] STICS

[illegible] attributes
[illegible]

b. What is the response mode? Do learners write an answer (verbal/text)? Do they speak the answer? Do they respond YES or NO on a machine (decision indicator)? Do they manipulate a device? What are the response characteristics of the medium?

c. How does the student receive feedback (evaluation)? Is feedback immediate? Delayed? Are only errors fed-back, or correct responses, too? Is each response evaluated or is evaluation global, as in post-session feedback where overall behavior is evaluated?

d. What are the environmental conditions? Classroom? Simulator? Real-world?

e. What are the special attributes? Does the device train entire teams? Does the device move? Fly? What is unique about this medium?

f. Is the medium best suited for a certain type of learning? Cognitive or general knowledge? Affective or attitudinal learning? Psychomotor or performing tasks?

g. Is the medium biased toward a certain level of learning? Real aircraft for advanced learners? Simulators for intermediate learners? Textbooks for beginning learners?

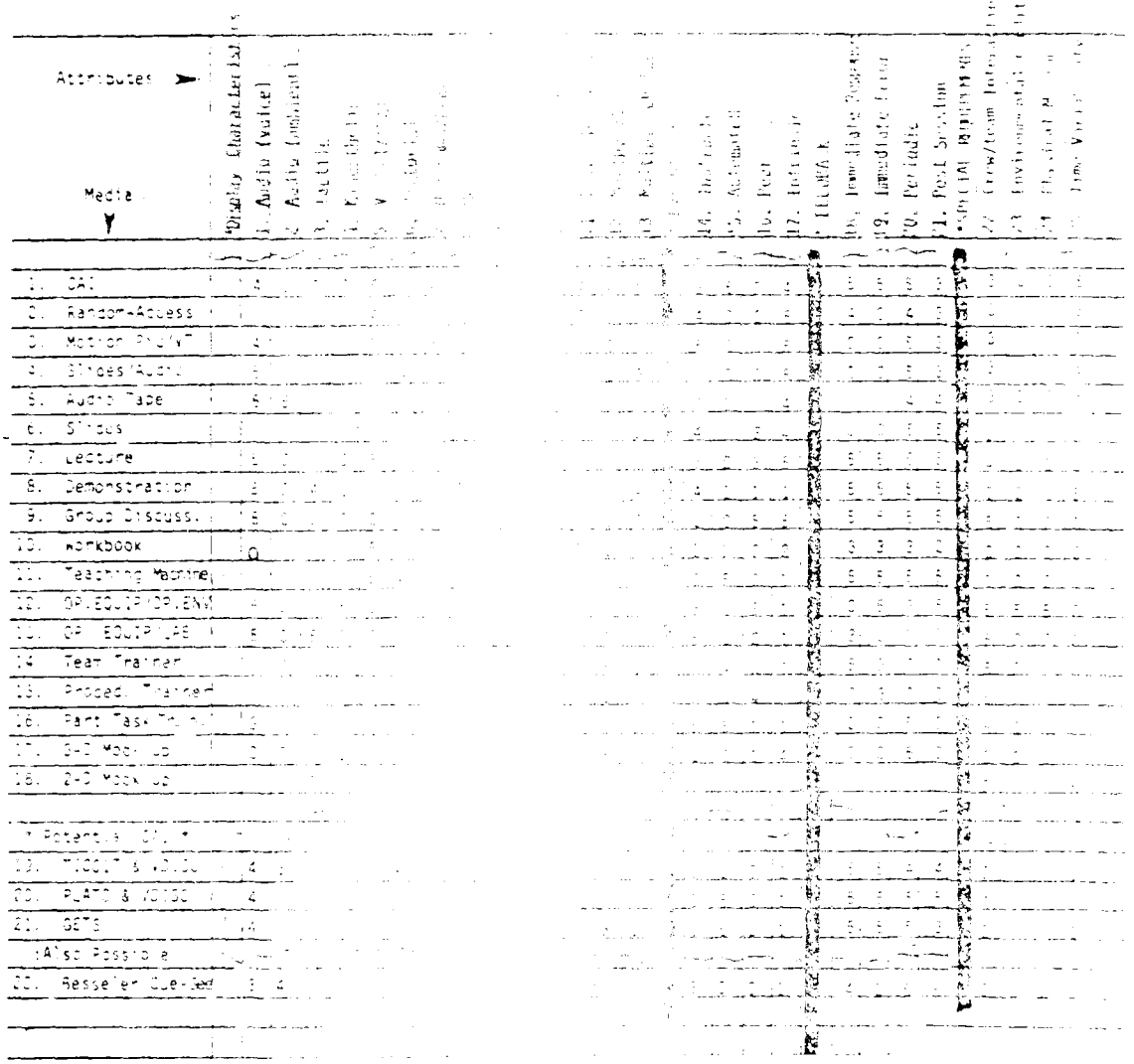
Next, organize all of the attributes for each medium within these categories and add more categories if necessary. Do not repeat redundancies in the attributes list.

5. Cross-reference media and their attributes

At this point, [illegible] Figure A-10, which shows a sample completed media pool. Note how the media are listed down the left-hand column, and the attributes are listed across the top row, creating a media-by-attributes matrix. It is strongly advised that you follow a similar procedure in creating a media pool since this will reduce the probability of making errors and facilitate data entry during the next step. Therefore, create a matrix with attributes listed across the top and media listed down the left-hand column.

You now want to weight the ability of each medium to deliver each instructional characteristic. The weighting is made with a single number, between 0 and 5. If the attribute has no relationship to this medium, give it a 0. If this attribute is its strong point, give it a 5. If it has the attribute, give it a rating between 1 and 4, depending on how well it provides the attribute being considered. In Figure A-10, note that the medium audio-tape is ranked 5 under the attribute audio-voice, indicating the strong relationship between the two. Of course, workbook is ranked 0 under the attribute audio-voice since it has no capability for delivering this characteristic. Also notice in Figure A-10,that attributes are listed across the top of the table and each

NAVI[illegible]



Attributes → / Media ↓	*Display Characteristics	1. Audio (voice)	2. Audio (ambient)	3. Tactile	4. [illegible]	5. [illegible]	6. [illegible]	7. [illegible]	8. [illegible]	9. [illegible]	10. [illegible]	11. [illegible]	12. [illegible]	13. Multiple [illegible]	14. Instructor	15. Automated	16. Peer	17. Infrared	*FEEDBACK	18. Immediate Response	19. Immediate Error	20. Periodic	21. Post Session	*SPECIAL REQUIREMENTS	22. Crew/team Interaction	23. Environmental Condition	24. Physical [illegible]	25. Time Variability
1. CAI		4																4		5	5	5	3					
2. Random-Access															4			4		4		4	3					
3. Motion Pic/VT		4																4				5	3					
4. Slides/Audio		5																4				5	3					
5. Audio Tape		5	5															4				4	4					
6. Slides															4			4				5	5					
7. Lecture		5																4		5	5	5	5					
8. Demonstration		5													4			4		5	5	5	5					
9. Group Discuss.		5																4		5	5	5	5					
10. Workbook		0																4		3	3	3	3					
11. Teaching Machine																		4		5	5	5	5					
12. OP.EQUIP/OP.ENV																		4		5	5	5	5					
13. OP. EQUIP/LAB		5																4		3								
14. Team Trainer																		4		5								
15. Proced. Trainer																		4										
16. Part Task Train.		3																4										
17. 3-D Mock Up		3																4				5	3					
18. 2-D Mock Up																												
* Potential CAI *																												
19. TICCIT & VDISC		4																4				4	4					
20. PLATO & VDISC		4																4		5	5	5	5					
21. GETS		4																4		5	5	5	3					
(Also Possible																												
22. Besseler Que-Sed		3	4															4		4								

Figure [illegible] [illegible] Attributes [illegible] Ve POOL.

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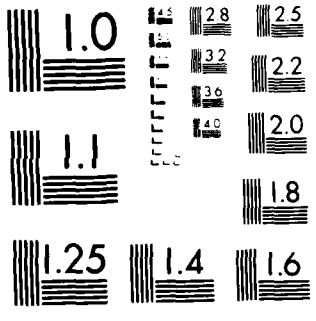

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

attribute is numbered. Headings for each attribute category are preceded by an asterisk (*) and the columns below each heading are lined out.

STEP 2: CREATING A MEDIA POOL DATA BASE (ON-LINE)

Once you have created a satisfactory media pool, you need to enter it into the computer as a data base. This requires getting the media selection system up and running on the computer as discussed in Section II of the manual. When the system is ready to go, the initial introduction will be written on the CRT. The START menu offers the following functions. . .

1. SELECT MEDIA
2. CREATE A MEDIA POOL DATA BASE
3. EDIT A MEDIA POOL
4. PRINT MEDIA POOL/SELECTION INFORMATION
5. RETURN TO OPERATING SYSTEM

ENTER SELECTION?

To enter your unique pool into the computer, type in a 2 <RETURN>. The next message requests that you make up a file name for the media pool. . .

WHAT IS THE MEDIA POOL FILE NAME TO BE?

The file name must be no more than eight characters in length and may not contain spaces or punctuation. It is advisable that you select a file name directly relevant to the media pool, and less than eight characters in length. This way, future revisions to the media pool can be numbered accordingly. For example, AIMS2, LESSON13, and MNGMNT are all valid file names. The names themselves help keep track of the training programs to which the media pools apply. Once you have successfully entered a file name, you need to go through the three-task process of listing media, listing attributes, and cross-referencing media and attributes, but this time you will be doing it on-line.

After the file name has been entered, the computer requests. . .

TASK 1

HOW MANY MEDIA WILL BE CONTAINED IN THIS POOL?

Type in the number on the worksheet followed by <RETURN>. The computer then displays. . .

TYPE IN EACH MEDIUM NAME FOLLOWED BY A <RETURN>

You want to type in the first medium name, enter it (by pressing <RETURN>), type in the second medium name, enter it, type in the third medium name, enter it, etc. The computer will number them for you as you go along, so you can keep checking back to the worksheet to make sure you have your numbering right. If you make a mistake, type in a 999 and the computer will

help you get things straightened out. When you have typed in the last medium, the CRT will automatically display the next message. . .

TASK 2

T·PE IN THE ATTRIBUTES AND *HEADINGS, FOLLOWING EACH ONE WITH A 'RETURN'. . .

ENTER AN ATTRIBUTE OR A *HEADING (1)?
(OR "0" WHEN DONE, 999 FOR HELP)

At this point, make sure you have all of the headings clearly marked on the worksheet with asterisks, "*". Make sure your attributes are numbered 1 through n, and that any headings or comments are not numbered. This is important, since anything that is not led with a "*" will be numbered and considered an attribute by the computer.

In response to the CRT request, type in an attribute or a *heading. An attribute will receive the numerical value that appears in parentheses on the CRT. A *heading will receive no numerical value. Keep track of the numbers as they progress, and make sure they agree with the numbers on the worksheet. If you make an error, enter a 999 as an attribute, and the computer will help you correct things. When you have typed in the last attribute, type in a 0 <RETURN> and you will get the next message. . .

TASK 3

CROSS-REFERENCE MEDIA AND ATTRIBUTES

This task results in the most errors because the user becomes careless in reading what is on the screen. Basically, you want to put in all of the rating numbers that relate the media to their attributes. When you are ready to proceed, the computer informs you of the medium you will be rating, then requests that you rate each relationship. It begins with the first medium and the fist attribute, proceeds to the second attribute, the third attribute, etc., all the way to the last medium and the last attribute. Each request will appear as a small model of the worksheet on the CRT.

SECTION VI

REFINING THE SELECTION PROCESS

While performing media selections with the standardized AIMS media pool (or even a unique media pool), you may find that the selections are adequate in a general sense, but could be improved to fit the training program at hand. This section provides examples of how to take information from preliminary media selections to refine the selection process by using the AIMS edit functions.

For example, perhaps you have a medium or several media in-house which are not on the AIMS media pool. You can rate each new medium with the attributes on the AIMS media pool, as described in Section V of this manual. Then, using the AIMS edit function, ADD A MEDIUM, you can add the new medium or media to the existing AIMS media pool without disturbing the rest of the data base.

In another example, assume that you have added some media, changed others, and performed several media selections for a group of objectives. By analyzing the selections, you may determine that the attributes on the present media pool do not sufficiently discriminate among the available media. Of course, determining how to better discriminate among media is a judgmental task that requires a certain amount of knowledge or experience from the user.

Assume the computer is generally selecting the following media for a group of objectives:

1. WORKBOOK
2. LECTURE
3. SLIDE/TAPE
4. RANDOM ACCESS SLIDES
5. CAI
6. BESSLER CUE-SEE

Now, suppose you know that CAI and random access slides should not be selected for these objectives because some of the students are in an early stage of learning and CAI and random access slides are only used for intermediate level students at the training site. It becomes clear that the AIMS system needs to make finer discriminations among beginning-level and intermediate-level students. This translates to the addition of two new attributes to the present media pool data base. Specifically:

1. EARLY STAGE OF LEARNING
2. INTERMEDIATE STAGE OF LEARNING

Then the user's job is to rate each medium in the media pool on a 0 (no relationship) to 5 (strong relationship) scale for these two new attributes. The media CAI and random access slides would receive a 0 rating on the EARLY STAGE OF LEARNING attribute, since these media are used solely for intermediate-level students. Suppose you also know that workbooks and

slide/tape are used strictly for beginning-level students. These two media would receive a 0 rating on the INTERMEDIATE LEVEL OF LEARNING attribute, and all other media would receive some rating greater than 0 for this attribute.

In the next step you would go to the computer, run the AIMS system, and from there call up the edit function, ADD AN ATTRIBUTE. Using the instructions provided, you would add the attribute EARLY STAGE OF LEARNING and rate each medium for this new attribute, being sure to assign 0 ratings to the media CAI and random access slides. Next you would add the attribute INTERMEDIATE LEVEL OF LEARNING and rank each medium accordingly. Of course, workbook and slide/tape would receive a 0 rating since they are not used at this stage of learning.

Once the new attributes have been added to the media pool data base, you would use the print functions on the AIMS system to produce a new selection worksheet. The new selection worksheet would include the new attributes and the usual check-off boxes for choosing the attributes as characteristics of the objective at hand. Having these additional attributes on the data base and worksheets would have the following effects (assuming the media were rated as they were in this example):

1. For those objectives in which EARLY STAGE OF LEARNING is determined to be an instructional characteristic on the worksheet, the computer will select all of the appropriate media except the 0-rated media CAI and random access slides. All other media will be selected and rank-ordered in the usual fashion.

2. For those objectives in which INTERMEDIATE LEVEL OF LEARNING is determined to be an instructional characteristic on the worksheet, the computer will select all of the appropriate media except the 0-rated media workbook and slide/tape. All other media will be selected and rank-ordered in the usual fashion.

3. For those objectives in which neither of the new attributes (EARLY STAGE OF LEARNING or INTERMEDIATE STAGE OF LEARNING) were selected as instructional characteristics, the computer will consider all of the media in the pool for selection, including workbook, slide/tape, random access slides and CAI. In other words, if neither of these attributes is considered to be of importance to the objective being "mediated," then the computer will make no discriminations based on these attributes when selecting media.

By adding two new attributes, you have provided the option of refining the selection process. If you choose to define an objective as being in either the early or intermediate stage of learning, you will be eliminating certain media from consideration for selection. Specifically, those media which were rated as having a 0 relationship with the determined attribute. If you choose not to specify a level of learning for a given objective, then neither of these attributes will have an effect on the computer's selection of media and all of the media in the media pool will be considered for selection and rank-ordered appropriately.

In yet another example, using the standardized AIMS media pool as a data base, assume that you find the computer often selecting the following two media for certain objectives:

1. PART TASK TRAINER
2. PROCEDURAL TRAINER

As the user, assume that you know that the main difference between the part task and procedural trainers at your site is that the part task trainer provides a computer-operated view of a moving target on a radar screen, while the procedural trainer does not. This fact makes MOVING TARGET an important attribute for selecting media. As in the last example, you could simply add MOVING TARGET as an attribute on the media pool data base to further refine the computer's selections. But in this instance, assume that the attribute COLOR on the data base is never used. By using the AIMS edit function, CHANGE AN ATTRIBUTE, you could replace the attribute COLOR with the attribute MOVING TARGET. Then you could re-rate all of the media with this new attribute, and thereby refine the selection procedure. The effect is the same as in the previous example of adding attributes, except you have replaced an irrelevant attribute with a relevant one.

Of course, experience in instructional design and development, as well as experience with the AIMS system, will provide the best lessons for refining the selection process. However, as a general procedure for refining AIMS media selections, it is recommended that you follow these steps:

1. Try some preliminary media selections and analyze the selections made.

2. Determine which media are relevant to the training program at hand and not in the present media pool data base, then add them to the media pool using the ADD A MEDIUM edit function.

3. Consider the possibilities for further discriminating among media selections, and translate these possibilities into concrete instructional characteristics or media attributes.

4. Determine if any media attributes or instructional characteristics on the present media pool data base are irrelevant to the needs of the training program at hand, then replace them with relevant attributes or instructional characteristics using the CHANGE AN ATTRIBUTE edit function.

5. Add any media attributes or instructional characteristics that are relevant to the training program at hand using the ADD AN ATTRIBUTE edit function.

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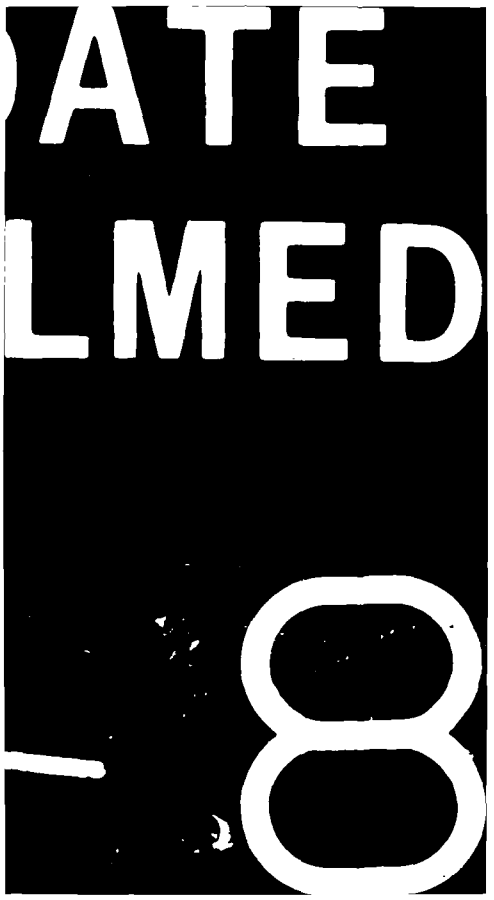
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